CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

CHAPTER 4. ENVIRONMENTAL IMPACTS

4.1 Introduction

In accordance with 40 CFR 1502.16, this chapter presents the anticipated environmental consequences of the actions proposed under each of the alternatives described in Chapter 2: Alternative A (No Action), Alternative B (Proposed Action Alternative), Alternative C, and Alternative K1.

For the purposes of this document, an *environmental impact* is defined as a change in the quality and/or quantity of a given resource due to a modification in the existing environment resulting from decisions related to the Alton Coal Tract. Impacts may be beneficial or adverse, may be direct or indirect, and may be permanent or temporary in a long-term or short-term duration. Unless otherwise specified, *short-term* is the period when the development of the mine and the mining of coal would occur. Under the Proposed Action, this would be approximately 25 years, under Alternative C, this would be approximately 21 years, and under Alternative K1, this would be approximately 16 years. *Long-term* effects are defined as those effects that would occur or remain after the cessation of coal mining and during, or continuing into the period following, the reclamation and monitoring period (also referred to as the bond release period). Long-term effects would occur for 25–35 (or more) years under the Proposed Action beginning with the onset of mine development. Under Alternative C, long-term effects would occur for 21–31 (or more) years beginning with the onset of mine development. Under Alternative K1, long-term effects would occur for 16–26 (or more) years beginning with the onset of mine development. Impacts may vary in degree from a slightly discernible change in the environment to a total change in the environment. The significance of these impacts is determined using the criteria set forth by the CEQ (40 CFR 1508.27) and the professional judgment of the specialists doing the analyses. Impact significance may range from negligible to substantial and may be significant during mining but reduced to less than significant following reclamation. The context where impacts occur can be local, regional, and national.

Impacts on private land are analyzed because the tract under the action alternatives includes split estate lands. In the tract, where the surface estate is privately owned, the minerals beneath the surface estate are administered by the BLM. These lands are therefore eligible for inclusion in the tract and analysis of impacts to them is required to comply with NEPA. Likewise, where the surface estate is owned and administered by the BLM, the subsurface estate is also administered by the BLM, and these lands are also included in the tract and analyzed in this EIS.

4.1.1 Types of Effects

Direct and indirect effects (also referred to as impacts) are the primary and secondary results, respectively, of the No Action Alterative, the Proposed Action, Alternative C, or Alternative K1. Direct impacts are caused by the action and occur at the same time and place. An example of a direct impact would be the removal of vegetation as part of the surface mining process on the tract. Indirect impacts from an action occur later in time and/or are removed in space. An example of an indirect impact would be an increase in recreational use on adjacent undisturbed and unrestricted land due to the direct impact of disturbing and/or precluding access on recreation lands in the tract. In many cases, direct and indirect impacts are described together in the analysis rather than differentiating between them. The impacts analysis area for direct and indirect impacts can vary between the resources analyzed. However, at a minimum, the tract is in the impacts analysis area for all resources, with the exception of transportation, which primarily considers the reasonably foreseeable coal haul transportation route in the analysis of impacts. The reasonably foreseeable coal haul transportation route is also considered in the impacts analysis area for direct and indirect impacts to other resources, such as aesthetics (namely noise), air resources, cultural resources, hazardous materials and hazardous and solid waste, recreation, socioeconomics, water resources, and wildlife and special status species. The coal haul transportation route that is used for analysis purposes is the most reasonably foreseeable route, but it is impossible to predict the exact route that a successful bidder might choose. Sections 4.2 through 4.18 describe the direct and indirect impacts of the No Action Alternative, the Proposed Action, Alternative C, and Alternative K1 for each resource brought forward for analysis in this EIS.

Cumulative impacts result from the incremental impacts of an action when added to other past, present, and RFFAs, regardless of who is responsible for such actions. Cumulative impacts may result from individually minor, but collectively significant actions occurring over a period of time (40 CFR 1508.7). The cumulative impacts assessment area (CIAA), a list and descriptions of other RFFAs, and the cumulative impacts analysis for each resource are contained in Section 4.19 Cumulative Impacts. Impacts from surface-mining operations on the adjacent Coal Hollow Mine and an additional potential private mine area north of the Coal Hollow Mine (see Map 1.1) are addressed in the cumulative impacts section. See Section 4.19 for a complete list of actions, including the private coal mines, which are analyzed in the cumulative impacts analysis.

Unavoidable adverse impacts would result from the Proposed Action, Alternative C, or Alternative K1 after the application of potential mitigation measures. Potential mitigation measures are intended to reduce impacts that are not already incorporated into the action alternatives as design features or existing regulatory requirements (i.e., under State of Utah, federal, and or local law and lease stipulations) and that may be applied to further reduce impacts following the results of the impacts analysis. Unavoidable adverse impacts may be permanent or may eventually subside or no longer result in adverse conditions over time. When unavoidable adverse impacts are permanent, the impacts are characterized as irreversible. Irreversible impacts are disclosed separately and described below.

The relationship between the short-term use of the environment or resource versus long-term productivity as it relates to the extraction of coal and resource-use sustainability are intertwined with direct and indirect effects. The mining of 44.9 million (Proposed Action), 38.1 million (Alternative C), or 30 million (Alternative K1) tons of coal from the tract would be a short-term use of the environment that would provide benefits in terms of the various potential uses of the coal resource in society. Following a lease sale, should BLM decide (as a result of this EIS) to offer the tract for competitive leasing, DOGM would have to permit mining on the tract prior to the beginning of mining activities. The permitting process is designed to 1) protect the long-term productivity of resources after the cessation of mining and 2) ensure that impacts to resources occurring during the mining process are minimized to the extent possible in the context of an economical, primarily surface-mining operation. Mining would alter many resources' ability to function naturally in the short term; however, the required topsoil salvaging and replacement, topographic recontouring to AOC, and revegetation (including seeding and, in some locations, planting seedlings) would promote the following long-term resource effects:

- Soil productivity reestablishment
- Native and suitable non-native vegetation reestablishment
- Wildlife and wildlife habitat rehabilitation
- Livestock grazing use
- Groundwater, surface water, and watershed function and stabilization
- Recreational use

Based on the analysis in this chapter, following mining activities the function of these resources and resource uses is expected to return to a condition approximating pre-mining conditions. To provide a clear context of the relationship between short-term use of the environment and long-term productivity, further discussions of these relationships are presented in each resource impacts analysis section in this chapter.

Irreversible and irretrievable commitments of resources (in other words, irreversible and irretrievable impacts) are also disclosed in the impacts analysis section for each resource. Irreversible impacts are those impacts that would result in changes to the environment that cannot be reversed, reclaimed, or repaired. An example of an irreversible impact would be the removal of coal from the tract. Once the in-place coal reserves present in the tract are removed, they can never be replaced or reclaimed. Irretrievable impacts, on the other hand, are those impacts that result in the temporary loss or degradation of the resource for a period of time. An example of an irretrievable impact would be the removal of vegetation from the tract as part of the mining process. During mining operations, the impact of vegetation removal would be irretrievable until the reclamation process is complete. Following reclamation, vegetative cover would be restored to the area.

Where possible, effects are quantified primarily through the use of geographic information systems (GIS) applications that allow for calculations of surface disturbance over portions of the tract under the Proposed Action, Alternative C, and Alternative K1, and through modeling and other analyses that provide estimates of loads, concentrations, noise and light levels, acres, and other measurable quantities.

4.1.2 Required Regulatory Actions, Design Features and Monitoring Measures, and Lease Stipulations

As indicated in Section 1.1, the issuance of a lease for the BLM-administered lands is a prerequisite for mining, but is not the enabling action that would allow mining to start. All mining and reclamation operations would comply with SMRCA, Utah statutes, and BLM lease stipulations developed for the tract. This impacts analysis considers all standing measures required by federal, State of Utah, and local regulatory authorities, as well as other design features, as part of the Proposed Action, Alternative C, and Alternative K1. Table 2.6.1 in Chapter 2 presents a table summarizing the existing, required State of Utah, federal, and local mitigation and monitoring requirements inherent to the Proposed Action, Alternative C, and Alternative K1. This table also includes the required lease stipulations that would be inherent to the Proposed Action, Alternative C, and Alternative K1. Required regulatory actions, mitigation and monitoring measures, and lease stipulations particular to each resource are also identified in the impacts analysis section under each resource. See Section 2.6.1.9 for a detailed discussion of design features (as summarized above) and the distinction between design features and potential mitigation measures.

4.1.3 General Analytical Assumptions, Guidelines, and Notes

This EIS assumes that all design features (required regulatory actions, mitigation and monitoring measures, and lease stipulations identified in Table 2.6.1) would be successfully implemented in the effectiveness limits of the measures undertaken. If such measures were not implemented, additional adverse impacts could occur. Additional assumptions that apply to all resource values and uses relate to 1) the analysis of impacts as a result of the placement of dispersed facilities on the tract and 2) the relocation of KFO Route 116 in the tract.

Because the exact location of dispersed facilities is not known at this time, the analysis of impacts as a result of the placement of dispersed facilities on the tract involved a set of assumptions that allowed for conservative estimates of the expected impacts. The estimated acreage necessary for dispersed facilities under each alternative (listed below and in Table 2.8.1 in Chapter 2 and tables in various resource sections) was provided by ACD based on experience and industry standards. Under the No Action Alternative, it was assumed that no dispersed facilities would be required because no mining would occur on the tract under this alternative. Under the Proposed Action it was assumed that

- dispersed facilities would include such items as water control structures (diversion ditches, sedimentation ponds, etc.), temporary light use roads (direct mine use and for transporting coal from areas of active mining to the centralized facilities), and temporary stockpiles of topsoil and/or overburden;

- dispersed facilities would require approximately 160 acres of land;
- dispersed facilities would be located wholly in the no-coal zone;
- acres of vegetation community type (or soil type, etc.) disturbed by dispersed facilities would be proportional to the percentage of each vegetation type in the no-coal zone;
- it would not be possible to avoid disturbance in established avoidance areas (sagebrush/grass communities and riparian areas); and
- standard mitigation measures would be required (e.g., BMPs) as part of the Proposed Action to reduce or eliminate impacts.

Analysis assumptions under Alternative C are the same as those described for the Proposed Action except that dispersed facilities would require approximately 135 acres of land under Alternative C. Likewise, analysis assumptions under Alternative K1 are the same as those described for the Proposed Action, except that dispersed facilities would require approximately 92 acres of land.

As with dispersed facilities, the exact location of the KFO Route 116 relocation is not known at this time; therefore, the analysis of impacts from the KFO Route 116 relocation involved a set of assumptions that allowed for conservative estimates of the expected impacts. These assumptions allowed for the creation of a theoretical/conceptual road alignment used to generate acres of disturbance figures and to determine possible impacts due to this aspect of the mining operation. Under the No Action Alternative, it was assumed that no road relocation would be required because no mining would occur on the tract under this alternative. Under the Proposed Action, the following are assumed:

- The relocation of KFO Route 116 would be temporary (for the life of mine), and the road would be reestablished in its approximate original roadbed following mining.
- The temporary alignment of the relocated KFO Route 116 would generally be north–south because the current alignment of KFO Route 116 is generally north–south.
- The temporary relocation of KFO Route 116 would occur wholly in the no-coal zone except in the northwestern portion of the tract (Block NW). In Block NW, the road would be temporarily relocated onto previously mined surface prior to reestablishment in the approximate original roadbed following mining of this block (the road relocation in Block NW would only be for the life of mining operations in this portion of the tract).
- The temporarily relocated KFO Route 116 would be 100 feet from the pit disturbance line and centralized facilities.
- The temporarily relocated KFO Route 116 would take the shortest distance from point of departure from the existing road to point of reconnection with the existing road in the confines of the other assumptions listed.
- The temporary relocation of KFO Route 116 would avoid sagebrush/grass communities and riparian areas (defined as a 330-foot buffer on streams as per BLM riparian policy) to the extent possible.
- The temporary relocation of KFO Route 116 would occur on slopes of 30% or less only.
- Standard mitigation measures would be required (e.g., BMPs) as part of the Proposed Action during road construction and maintenance for the life of the temporary road (life of mine);
- The temporary relocation of KFO Route 116 would occur within a 66-foot-wide ROW with a 24-foot-wide road surface.
- Two stream crossings would be required (one for Robinson Creek and one for Kanab Creek) in addition to crossings of washes.
- Appropriate culverts would be installed at stream crossings.
- Road base materials (gravel and other rock) would come from on-site where available and from off-site otherwise.

Analysis assumptions under Alternative C and Alternative K1 are the same as those described for the Proposed Action, except that Block NW is not included in the tract configuration under Alternative C and Alternative K1. Also, Blocks S and Sa are not included in the tract configuration under Alternative K1 and therefore relocation of KFO Route 116 would not be needed in this block under this alternative.

For purposes of analysis for certain resources, it was necessary to make additional assumptions particular to that resource analysis. These assumptions are listed and explained in the impacts analysis section for each resource, where they apply.

Impacts analyses generally considered pit disturbance as a total acreage of disturbance for the life of the mine under each alternative. It is important to note that pit disturbance would not occur all at one time. It would occur on a continuing basis concurrent with reclamation. This approach was taken primarily because the exact mine sequence is unknown at this time. As described in Chapter 2, under the Proposed Action at any one time, active mining operations (open surface-mining pits from which coal is being removed and/or areas where topsoil and overburden are being removed) would involve approximately 120 acres (1 open pit). An additional 120 acres or more would be in some stage of reclamation (overburden replacement and top-soiling, grading to AOC, or seedbed beginning). Under Alternative C, at any one time, active and suspended (due to seasonal timing restrictions) mining operations would involve an estimated 240 acres (2 pits). An additional 240 acres or more would be in some stage of reclamation. Under Alternative K1, at any one time, active mining operations and reclamation would involve the same acreage as the Proposed Action.

Surface-disturbing impacts (613 acres in the tract plus 166 acres outside the tract[1]) resulting from subsidence in the portion of the tract that would be underground mined are considered primarily with respect to the analysis of geology and minerals (see Section 4.6) and water resources (see Section 4.16). For most resources, subsidence is not factored into calculations of surface disturbance because vegetation removal, soil removal, or overburden removal would not occur. No reclamation would occur in this area of the tract either, except for activities to eliminate or repair damage being done to other resources (for example, water resources). Activities to eliminate or repair damage resulting from subsidence include grouting and backfilling. Grouting generally consists of drilling a series of boreholes into the mine voids and filling those voids with a concrete-like mixture that eliminates the likelihood of future subsidence events.

4.1.4 Notes on Data Sources and Tract Acreage

Data and information used to analyze impacts were gleaned from a variety of sources, including internet sources, peer reviewed literature, government agency documents, current and historic permitting documents, and documents reporting the results of studies and data collection efforts completed for this EIS in specific. Greater detail related to these sources is provided in Chapter 3, Section 3.1.

As explained in Table 1.1.1 and 2.3.1 in Chapters 1 and 2, respectively, and reiterated in Section 3.1, in this analysis, a tract acreage of approximately 3,576 acres is used rather than the approximately 3,581.27 acres listed in the NOI. For an explanation of the reason for this 5-acre difference, see Table 1.1.1, Table 2.3.1, or Section 3.1. Finally, some corrections and updates in acreages and other information have been made to develop this SDEIS. This includes new information about the affected resources that has become available since the publication of the DEIS.

[1] Two sets of acres numbers are used. One relates to underground mining acres, and the other is surface related due to subsidence, which is a portion of the underground mining.

4.2 Aesthetic Resources

Four different alternatives are analyzed in this section, and each alternative presents a varying degree of impacts to aesthetic resources in the area of analysis. Each alternative considers different tract boundaries and different levels of mining allowed. When impacts from elements of the Proposed Action and alternatives are similar, their effects are discussed together. Both adverse and beneficial impacts are discussed in this section. Additionally, both direct and indirect impacts are discussed.

Aesthetic resources would be impacted in the short term during the active mining period (life of the mine). In the case of noise and night sky conditions, resources would return to current conditions immediately upon conclusion of the active mining period. In the case of visual resources, conditions would be returned to a more natural landscape during both the active mining period (through ongoing reclamation) and the post-mining reclamation (10 years). Through the evaluation of aesthetic resources (sound, visual resources, and night skies), it was concluded that each has different thresholds for impacts to become significant. Those thresholds are described in more detail below.

4.2.1 Regulatory Framework

There are no state or local noise ordinances in place for the tract. The EPA, however, has defined standards to prevent hearing loss. The EPA has identified a 24-hour exposure level of 70 L_{dn} as the level of environmental noise to prevent measurable hearing loss to human receptors over a lifetime (EPA 1974). The EPA further identifies levels of 55 dBA outdoors and 45 dBA indoors to prevent annoyance to noise-sensitive human receptors.

MSHA also has health standards to prevent hearing loss. Under MSHA standards, mine employees are never permitted to be exposed to noise levels of 115 dBA or greater. MSHA requires that exposure to noise levels between 85 and 115 dBA be mitigated through hearing-protection programs, which can include personal protective equipment if shown to be necessary.

Additionally, MSHA regulations governing the use of explosives for mines specify maximum limits for blasting noise and vibration at “any dwelling, public building, school, church, or community or institutional building” according to the levels presented in 30 CFR 816.67(b)(i). See Chapter 3, Tables 3.2.4 and 3.2.5 for more detail.

FLPMA requires that the BLM periodically prepare and update its land use plans. In that process, the agency establishes objectives for management of visual resources, or landscape protection and change. The public lands in the tract are managed under VRM Class IV objectives. The objective of Class IV is to provide for management activities that require major modifications to the existing character of the landscape. These activities may dominate the view and may be the major focus of the viewer’s attention.

There are no legal or regulatory requirements with respect to skyglow on or near the tract, except for lighting ordinances in the town code of Brian Head, Utah. These ordinances intend to reduce light pollution to protect the night skies of nearby Cedar Breaks National Monument and include provisions for the following:

- Mounting light fixtures to buildings to reduce uplight and light spill
- Shielding lamps to reduce uplight
- Aiming lamps to reduce light spill
- Promoting the use of energy efficient lighting
- Restricting lamp wattage
- Requiring city council reviews of lighting plans for new developments and subdivisions (Sterling Codifiers 2013)

MSHA is the regulatory entity responsible for the administration and enforcement of mandatory federal mine safety and health standards in the United States, including requirements for adequate lighting for nighttime mining activities. MSHA statutes 30 CFR 56.17001 (Illumination of Surface Working Areas) and 30 CFR 77.207 (Illumination) require all mine sites to provide lighting sufficient for safe working conditions. Both statutes state the following: "Illumination sufficient to provide safe working conditions shall be provided in and on all surface structures, paths, walkways, stairways, switch panels, loading and dumping sites, and work areas."

In addition, the NPS is committed to preserving night skies as a resource for future generations (NPS 2012b, 2013c). In particular, Bryce Canyon National Park's dark skies are a major attraction for visitors. The park maintains an active astronomy and night sky program and describes its geographic location with respect to dark skies as "the last grand sanctuary of natural darkness." On average, Bryce Canyon offers 142 astronomy programs each year, holds an annual astronomy festival, and encourages those interested in night sky viewing to visit the park during moon phases when the sky is at its darkest (NPS 2013b).

The KFO RMP (BLM 2008b) does not prescribe any specific surface stipulations for management and protection of aesthetic resources in the tract. However, based on the analysis, the successful bidder would be required to employ skyglow minimization measures for nighttime mining operations as described in Table 2.6.1.

4.2.2 Soundscape

Impacts to noise-sensitive receptors near the tract and along the reasonably foreseeable coal haul transportation route were evaluated based on the changes in ambient noise levels caused by the Proposed Action and alternatives. Noise-sensitive receptors consist of residences, hospitals, libraries, recreation areas, churches, and similar locations. The analysis of noise-sensitive receptors in this section only considers noise as it relates to the human environment. For a discussion of the impacts to wildlife health and behavior from changes in ambient noise levels caused by the Proposed Action and alternatives, refer to Sections 4.17 and 4.18. Four different alternatives are analyzed in this section, and each presents a varying degree of impacts to noise-sensitive receptors near the tract. Each alternative considers different tract sizes as well as different seasonal operational restrictions. Alternative C and Alternative K1 were developed in part to address concerns over impacts to noise-sensitive receptors in the town of Alton.

There are several management prescriptions and considerations common to the action alternatives that would have impacts on noise-sensitive receptors. These include regulatory permit requirements such as MSHA inspections, short haul routes, and the coal loadout location and coal haul transportation route.

MSHA inspections would ensure that the mine is in compliance with the health standards set to minimize the risk of hearing loss among mine employees. Direct protection of the health and safety of mine employees resulting from MSHA inspections would occur under the action alternatives through the duration of the mining operation.

Ambient noise levels would increase as a result of coal truck traffic on the short haul route out of the tract. Impacts to noise-sensitive receptors would vary depending on the final short haul route selected.

The BLM received comments on the DEIS regarding the need to more quantitatively address potential noise impacts to existing soundscapes from the Proposed Action and alternatives. A computerized noise modeling study of potential noise impacts was conducted to address noise-related comments, guided by protocols devised with collaborating agencies such as the NPS. The noise modeling study was done in accordance with the noise modeling technical report (see Appendix L).

4.2.2.1 ALTERNATIVE A: NO ACTION

Under the No Action Alternative, ACD's application to lease the coal included in the tract would not be approved, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities on private land adjacent to the tract (the Coal Hollow Mine). No impacts to noise-sensitive human receptors from increases in ambient noise levels would occur from the No Action Alternative.

Under the No Action Alternative, the current land uses would continue, including livestock grazing, backcountry driving, hunting, and vegetation treatments to maintain and enhance livestock forage, wildlife habitat, and watershed condition.

4.2.2.2 ALTERNATIVE B: PROPOSED ACTION

The following equipment and associated activities common to the action alternatives would occur under the Proposed Action and would result in impacts to noise- sensitive human receptors:

- Heavy equipment, consisting of dozers, scrapers, excavators, front-end loaders, graders, and water trucks, would be used during surface-mining operations in the tract.
- Diesel generators would be used to power all necessary facilities as well as temporary and permanent light sources.
- Coal haul trucks would travel to and from the tract.
- Coal would be loaded onto rail cars from coal haul trucks.
- Workers would commute to and from the tract.
- A conveyer belt and crusher would be used to process excavated coal.
- Blasting events would occur during the course of mining on the tract.

Under the Proposed Action and alternatives, sensitive noise human receptors on and near the tract, reasonably foreseeable coal haul routes, and proposed rail loadout would experience an increase in noise levels that are above the current conditions. Additionally, vibration emissions would result from blasting events. The extent of expected noise and vibration is discussed in further detail in this section. Noise and vibration impacts from the Proposed Action and alternatives are compared against human receptor thresholds, MSHA thresholds, thresholds of awareness, and existing background noise levels to determine the level of impact that could result. Regulatory thresholds and existing background conditions for noise are discussed in detail in Sections 3.2.1.3 and 3.2.1.4. Background conditions for vibration levels are assumed to be zero. In general, an adverse impact would result if predicted noise or vibration levels exceed MSHA thresholds.

4.2.2.2.1 Noise Impacts

Under the Proposed Action, ambient noise levels in the soundscape analysis area would increase as a result of heavy equipment use, truck traffic, and rail loadout associated with mining activities. Increases in ambient noise levels would result from the following sources of on-tract activity noise: a variety of mobile-source mining equipment, centralized stationary processing equipment, and blasting events. Off-tract increases in ambient noise levels would result from increased vehicular traffic on public roadways from worker-commute trips and coal haul truck trips to and from the tract as well as truck to rail loading at the proposed rail loadout location.

Noise impacts from rail loadout activities are analyzed to determine probable noise impacts to the nearest residential area. The closest residential area to the proposed loadout is an unnamed community approximately 4.5 miles (7.2 km) east of the loadout location. This residential area is in census tract 1103, which is an identified EJ community (see Section 3.12.4). Noise levels at the proposed rail loadout location and surrounding areas were not included in the modeling analysis because the residential area in census tract 1103 was identified following noise modeling. This analysis uses the classical equation of sound propagation from the source (loadout location) to determine potential impacts (noise levels) to the identified sound receptor (unnamed community).

Baseline conditions at the unnamed community are assumed to be those of the lowest recorded value for Bryce Canyon (40.0 dBA L_{eq}). The sound power level of rail loadout activities is assumed to be 114 dBA; these are actual values measured at a coal rail loadout expected to be similar to proposed activities for the Alton Coal Tract (Queensland Parks and Wildlife Service 2006).

Because the sound source(s) is primarily near or at ground level, a directivity factor equal to two was chosen as most representative of sound propagation from rail loadout activities (sound propagating hemispherically from the source). Therefore, using the sound power level of a representative source of 114 dBA and a directivity factor of 2, the following sound pressure levels at certain distances were generated from the classical equation of sound propagation from a source (Figure 4.2.1).

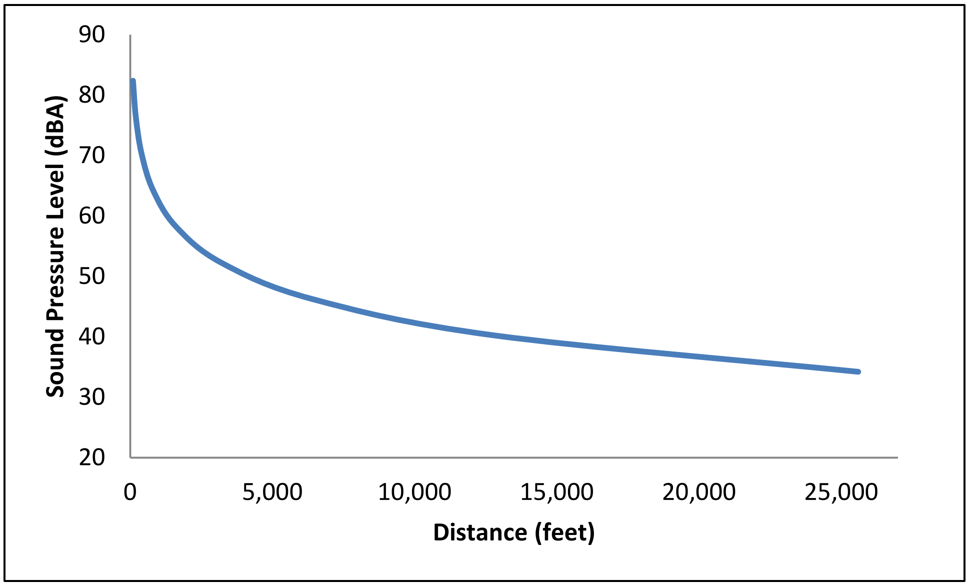

Figure 4.2.1. Rail loadout noise levels vs. distance.

According to Figure 4.2.1, a cluster of residences located a distance approximately 4.5 miles (7.2 km or 23,760 feet) away could expect the noise from rail loadout to attenuate to approximately 35 dBA, well below regulatory thresholds and likely well below ambient background noise.

Traffic noise from nearby roadways would likely be negligible, because noise from the rail loadout would likely be significantly noisier. For example, the highest noise levels anticipated from the roadways analyzed for the sound modeling were approximately 60 dBA at a distance of 100 feet. This is an approximately 20-dB difference from that expected from the rail loadout (20 dB = 2 bels = 100 times higher noise levels from the train loadout); therefore, adding in roadway noise would have a negligible impact to noise levels at given distances from the rail loadout.

4.2.2.2.1.1 Modeling Protocol and Specifications

Noise levels were modeled and analyzed from mobile and stationary mining equipment sources, increased traffic levels on local roadways, and blasting events. See Table 4.2.1 for identified plant and fleet equipment and associated noise levels. These sources were analyzed and/or modeled to determine if noise impacts would be above existing ambient conditions at several designated sensitive noise receptors: Yovimpa Point, Riggs Spring, and Farview Point in Bryce Canyon National Park; and the towns of Alton, Hatch, and Panguitch along the coal haul transportation route. The model also accounted for on-tract noise. The active area sage-grouse lek was also analyzed and is described further in Section 4.18 (Wildlife: Special Status Species).

Table 4.2.1. Plant and Equipment Fleet for Mining Activities

Source	Quantity	dBA per Equipment	Information Source
Mobile			
Haul truck	5	124	Cowal Gold Mine EIS (Barrick Gold Corporation 2009)
Front-end loader	3	117	Barrick Gold Corporation (2009)
Excavator	1	123	Ensham Central Project Environmental Noise Assessment (Ensham Resources 2006)
Dozer	6	118	Barrick Gold Corporation (2009)
Track hoe	2	121	Barrick Gold Corporation (2009)
Skytrack*	1	123	Barrick Gold Corporation (2009)
Grader	2	110	Ensham Resources (2006)
Water truck	2	118	Ensham Resources (2006)
Scraper	4	116	Barrick Gold Corporation (2009)
Diesel generator	3	100	Ensham Resources (2006)
Drill	1	118	Barrick Gold Corporation (2009)
Total Mobile Equipment	**30**	**134**	**–**
Fixed			
Central processing area (e.g., coal crushing, conveying, stacking, and loading)	–	124	Barrick Gold Corporation (2009)

Notes: Sources are intended to be reasonably representative of equipment that would be used during mining operations, but may vary depending on the availability of exact equipment at the time mining operations would occur.

* Sound power level was assumed to be equivalent to those of an excavator.

SoundPLAN Essential, Version 2.0, was the model chosen to evaluate the noise emissions from mine-related activities. Based on industry-accepted sound power levels from equipment manufacturers and other sources, SoundPLAN estimates noise contours of the overall facility. The model accounts for all sound propagation losses (geometric spreading, existing source absorption, and barrier shielding) and reflections of sound off adjacent structures and the ground.

Three separate modeling runs for mine-related noise were evaluated in each of the mining blocks: Block NW, which is the block closest to the town of Alton; Block C, which is closest to Bryce Canyon National Park; and Block S, which is closest to several sage-grouse leks. Noise-emitting equipment and processes were only evaluated within these three blocks because noise levels from mining activities in the other mining blocks (CWN and CWS) would be of equal or less impact because they are farther away from sensitive receptors. Modeling also included process area sources and roadway area sources around the town of Alton. Two additional modeling runs were conducted for the roadways associated with coal haul traffic in the towns of Hatch and Panguitch.

Impacts to noise-sensitive human receptors would vary depending on the location of active mining operations during the 25-year mine life. Modeling mobile equipment impacts to specific sources is difficult because equipment can travel to any location within the tract. Therefore, mobile equipment types were modeled together as a single 40-acre source assumed to emit at the highest emission level (134 dBA), as if all equipment types were simultaneously operating at full capacity and were “stacked” together. This effectively maximized the additive effects of noise levels from each piece of equipment, representing the most conservative model approach while simultaneously addressing the difficulties inherent in modeling mobile sources.

The 40-acre mobile area source was placed within each mining block closest to the noise-sensitive receptor (human and wildlife) of greatest concern to mining in that block (the town of Alton for Block NW, Bryce Canyon National Park for Block C, the sage-grouse lek for Block S) (Map 4.1). In addition, the model took into account noise generated from centralized facilities modeled as a 35-acre area source block within the tract where stationary processing equipment would be located for the life of the mine. See Map 4.1 for the specific location of these model inputs.

4.2.2.2.1.2 Noise Modeling Results

Modeling results for noise level increases to noise-sensitive receptors under the Proposed Action are summarized in Table 4.2.2 and Table 4.2.3. Table 4.2.2 compares the modeling results to background noise levels, whereas Table 4.2.3 compares modeling results to regulatory thresholds. Under the Proposed Action, mining would occur on each of the mining blocks (Block NW, Block C, and Block S) at various points over the life of the mine.

Table 4.2.2. Modeled Values Compared to Background Values for Sound at Individual Point Receptors as a Result of Mining on Various Blocks under the Proposed Action and Alternatives

Receiver Description	Background Level		Proposed Action* (mining in Block NW)	Alternative C* (mining in Block C)	Alternative K1 (mining in Block C)
	L_{eq} dBA	L_{nat} dBA	dBA	dBA	dBA
Farview Point (Bryce Canyon)	53.0	31.8	0	0	0
Yovimpa Point (Bryce Canyon)	42.0	27.1	0	0	0
Riggs Spring B (Bryce Canyon)	40.0	24.5	0	0	0
Town of Alton (southwest corner of Center Street and 1st East Street)	41.0	–	61.4	50.2	50.2

Notes: L_{nat} is what the NPS considers would be the ambient noise level if human influence were removed. L_{eq} describes the equivalent continuous sound level averaged over a certain timeframe in describing actual measured ambient conditions (for example, this value can be presented as a 1-hour average, a 24-hour average, etc.).

* Model results for mining Block S do not appear in the table because the table reports only the highest modeled values at individual sound receptors, and Block S is the furthest mining block from all four receivers listed. Modeled sound levels from mining on Block S were 0 at all the Bryce Canyon receivers and 43.3 dBA at the Town of Alton.

As detailed in Table 4.2.2, all combined mining activities from both on-tract (mobile and stationary) and off-tract sources (coal haul transportation and worker commuting) while mining on any of the three blocks would produce no detectable noise levels at any of the Bryce Canyon receivers.

Calculated noise levels at the receiver point in the town of Alton (61.4 dBA) from mining on Block NW (the block closest to the town of Alton) under the Proposed Action exceed expected background levels by approximately 20 dBA. Calculated noise levels at the receiver in Alton for mining on Block C exceed background noise levels by approximately 9.2 dBA, and by approximately 2.3 dBA while mining on Block S (the furthest block from Alton). Noise level contributions from the different sources to the various receptor sites are detailed in Appendix L.

As shown in Appendix L, noise level contributions from mining activities on Block NW account for the greatest source of modeled noise to the receptor analyzed in the town, accounting for 61.3 dBA of the 61.4-dBA impact. In contrast, noise level contributions from mining activities on Block C account for the greatest source of modeled noise to the receptor analyzed in the town, accounting for 49.2 dBA of the 50.2-dBA impact. Lastly, noise level contributions from the local roadways running from the tract through the town of Alton are the greatest source of modeled noise while mining in Block S to the receptor analyzed in the town, accounting for 43.1 dBA of the 43.3-dBA impact. Therefore, the greatest noise impacts to the receptor in Alton while mining on Block NW and C come from mining on the tract. In contrast, the greatest noise impacts to the receptor in Alton while mining on Block S come from roadway noise.

Mining activity on Block NW could exceed regulatory thresholds for noise. A continuously emitting noise of 61.4 dBA corresponds to 67.8 dBA L_{dn} (10 dB are added to the noise levels from 10:00 p.m. to 7:00 a.m., and the noise level is then averaged over the full 24-hour period). This noise level would exceed the EPA and HUD regulatory thresholds cited in Section 3.2.1.3 of 55 dBA and 65 dBA L_{dn}, respectively (Table 4.2.3). Even though the total noise level of 61.4 dBA could exceed regulatory noise limits for certain categories of land use under FHWA standards (as shown in Section 3.2.1.3), most of this noise would come from mining activities, not increased traffic on roadways, and therefore the FHWA regulatory thresholds would not be exceeded.

Table 4.2.3. Modeled Values Compared to Regulatory Thresholds for Sound at Individual Point Receptors as a Result of Mining on Various Blocks under the Proposed Action and Alternatives

Receiver Description	Regulatory Threshold			Proposed Action (mining in Block NW) dBA (L_{dn} dBA)	Alternative C (mining in Block C) dBA (L_{dn} dBA)	Alternative K1 (mining in Block C) dBA (L_{dn} dBA)
	EPA (dBA L_{dn})	HUD (dBA L_{dn})	FHWA (dBA L_{eq})*			
Farview Point (Bryce Canyon)	55	–	57	0	0	0
Yovimpa Point (Bryce Canyon)	55	–	57	0	0	0
Riggs Spring B (Bryce Canyon)	55	–	57	0	0	0
Town of Alton (southwest corner of Center Street and 1st East Street)	55	65	67	61.4 (67.8)	50.2 (56.6)	50.2 (56.6)

* This value is for 1-hour L_{eq}.

Notes: L_{dn} definition: day-night sound level (L_{dn}) is the A-weighted equivalent sound level for a 24-hour period with an additional 10-dB weighting imposed on the equivalent sound levels occurring during nighttime hours (10 p.m. to 7 a.m.).

Model results for mining Block S do not appear in the table because the table reports only the highest modeled values at individual sound receptors, and Block S is the furthest mining block from all four receivers listed. Modeled sound levels from mining on Block S were 0 at all the Bryce Canyon receivers and 43.3 dBA (49.7 dBA L_{dn}) at the town of Alton.

In contrast, noise impacts to the town of Alton from mining on Block C would be lower than those from mining on Block NW. Noise impacts would be approximately 56.6 dBA L_{dn}, which would be in excess of EPA thresholds of 55 dBA L_{dn}, but not HUD thresholds. Sound levels from mining activities in Block S (43.3 dBA; 49.7 dBA L_{dn}) would not exceed regulatory thresholds in the town of Alton for noise.

The noise modeling report contains an appendix (Appendix C of the SDEIS's Appendix L) that presents noise level contributions from the various modeled sources to individual point receptors. The modeling report indicates that noise impacts from roadway noise to the town of Alton receptor would be approximately 43.1 dBA (the remainder of the modeled noise impacts to the town of Alton receptor coming from mining activities on the tract). These impacts would be from both baseline traffic conditions (existing traffic, which is accounted for in the measured background levels) and mine-related impacts from coal haul truck trips and worker commuter trips. This value is significantly below the 67-dBA 1-hour L_{eq} FHWA standard for Category B land uses (residences, motels, churches, libraries, parks, etc.), as identified in Section 3.2.1.3.

In addition to the modeling that took place for specific receptor sites in Bryce Canyon and Alton, as detailed in Tables 4.2.2 and 4.2.3, separate modeling was completed for roadway noise impacts to the towns of Hatch and Panguitch. As can be seen on the contour line and grid noise map for the towns of Hatch and Panguitch (Figure 4.2.2 and 4.2.3), residences and commercial enterprises adjacent to or near the roadway could experience noise levels as high as 64 dBA as a result of mine-related haul and commuter traffic roadway noise along SR-89. This modeled impact included noise from both baseline traffic conditions (existing traffic, which is accounted for in the measured background levels) and mine-related impacts from coal haul truck trips and worker commuter trips. This is equivalent to the currently measured baseline value of 64 dBA measured in both towns as presented in Section 3.2.1 (Soundscape). Additionally, this value would be below the 67-dBA 1-hour L_{eq} FHWA standard for Category B land uses for both towns.

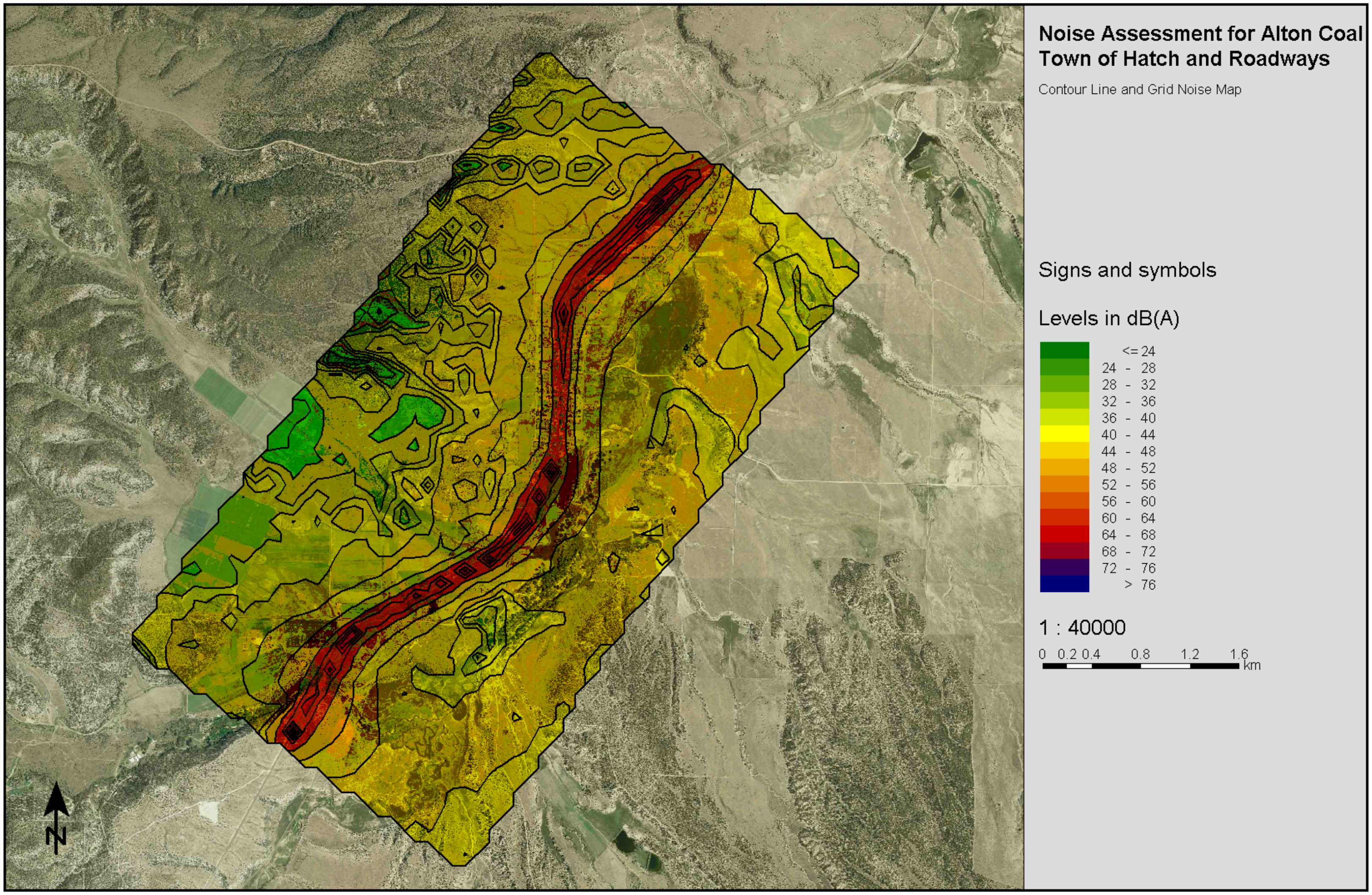

Figure 4.2.2. Contour line and grid noise map for town of Hatch.

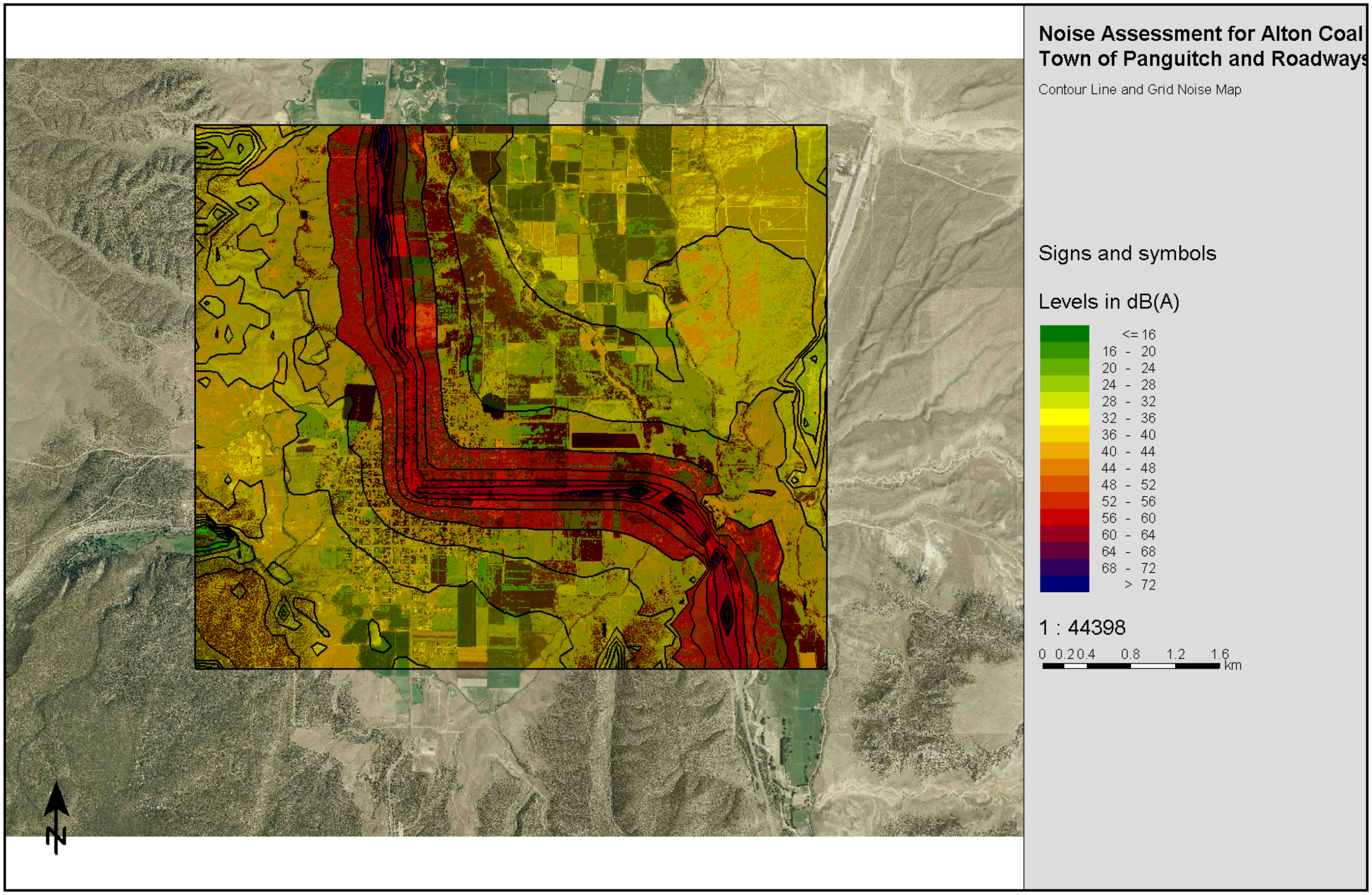

Figure 4.2.3. Contour line and grid noise map for town of Panguitch.

4.2.2.2.2 Blasting Noise and Vibration

Mine blasting can result in substantial vibration. Blasting releases large amounts of energy to fracture, split apart, and/or displace the rock immediately surrounding the explosive charge. The explosive energy released from blasting decreases proportionally with distance to a point where shattering or displacement of the rock no longer occurs. The remaining blasting energy travels through the rock under multiple elastic vibration waveforms (i.e., radial, vertical, and transverse waveforms). Ground vibration at sufficiently high levels can be felt by people or wildlife and can damage buildings. The DOGM requirements in regard to blasting are discussed in Section 2.3.2.4.

Air vibration (or airblast) emissions also result from the pressure or shockwaves emitted during blasting activities. Pressure waves resulting from blasting can quickly increase and decrease the air pressure at a given point from the blast. The airblast noise from blasting can be loud enough to be heard over great distances and even potentially damage the hearing of people or wildlife that are too close to the blast. However, because mine blasting vibrations are both highly transient and occur at a low frequency range, vibrations from mine blasting emissions are generally assessed using empirical equations rather than a computer model. Therefore, equations are used to estimate vibration levels at specific points of interest from blasting emissions.

The analysis conducted for noise and vibration as a result of mine-related blasting assumed the most conservative scenario based on the following factors:

- ACD provided information indicating that the lowest possible maximum charge mass per delay used in blasting would be 17.3 pounds per delay, and that the highest would be 266 pounds per delay. The value of 266 pounds per delay was used in all calculations.
- Calculations assumed the closest possible point of blasting within each mining tract to the closest structure in the town of Alton (as seen on Google Earth).
- The lowest identified regulatory threshold for vibration and airblast noise, human detection, and damage to buildings was used in the discussion for comparison against calculated values.

By using 266 pounds per delay, the shortest distance between two points, and the lowest identified regulatory thresholds for analyzing noise and vibrations as a result of mine blasting, calculated values are presented as worst case scenario impacts and are therefore conservative. Actual impacts would likely be considerably lower than calculated values over the life of the mine.

As discussed in Chapter 3 and the noise modeling report (see Appendix L), the lowest identified threshold for airblast noise at which building damage or human disturbance would be expected is 134 dB linear. The lowest threshold identified at which noise levels from blasting would be barely noticeable for humans is 100 dB linear. The lowest threshold at which building damage could be expected from blasting vibration is 0.5 inch per second. For human awareness of blasting vibration, the threshold varies based on whether or not an individual is outdoors or inside a building. The lowest identified threshold for awareness from blasting vibration outdoors is 0.035 inch per second, whereas the lowest identified threshold of human awareness in buildings is 0.004 inch per second. Table 4.2.4 presents modeled blasting noise and vibration levels alongside regulatory thresholds at various blasting receptor sites for the Proposed Action and its alternatives.

Table 4.2.4. Calculated Vibration Levels at Individual Point Receptors as a Result of Mining on Various Blocks under the Proposed Action and Alternatives

Receptor	Alternative	Distance from Blast (feet)	Threshold Value				Highest Calculated Value	
			Peak Particle Velocity (building damage) (inches per second)*	Peak Particle Velocity (human awareness) (inches per second)[†,‡]	Sound Pressure Level (building damage) (dB linear)[¥]	Sound Pressure Level (human awareness) (dB linear)[§]	Peak Particle Velocity (inches per second)	Sound Pressure Level (dB linear)
50 feet from blast	All Alternatives (Block C, NW, or S)	50	0.5	0.035	134	100	79.8	186
Farview Point (Bryce Canyon)	Alternatives C and K1 (Block C)	65,000	0.5	0.035	134	100	0.0012	90
Yovimpa Point (Bryce Canyon)	Alternatives C and K1 (Block C)	65,000	0.5	0.035	134	100	0.0015	91
Riggs Spring B (Bryce Canyon)	Alternatives C and K1 (Block C)	74,000	0.5	0.035	134	100	0.0015	91
Town of Alton (nearest residence)	Proposed Action (Block NW)	500	0.5	0.004	134	100	2.4	154
Town of Alton (nearest residence)	Alternatives C and K1 (Block C)	5,400	0.5	0.004	134	100	0.065	120
Town of Alton (nearest residence)	Alternative C (Block S)	20,000	0.5	0.004	134	100	0.0088	102

* Data from Chae (1978) and Siskind et al. (1980).

† 0.035 inch/second peak particle velocity for human awareness outdoors (Wiss et al. 1974).

‡ 0.004 inch/second peak particle velocity for human awareness indoors (Jones & Stokes 2004).

¥ MSHA (30 CFR 816.67(b)).

§ Data from Richards and Moore (2009, 1997), and AECOM (2011).

As Table 4.2.4 indicates, blasting noise impacts modeled for the three Bryce Canyon National Park receiver points were either 90 or 91 dB linear, which are well below the 100-dB linear threshold of human awareness. Vibration impacts to Bryce Canyon National Park receiver points analyzed were 0.0012 and 0.0015 inch per second, also below the threshold of human awareness at 0.035 inch per second.

Both noise and vibration impacts from blasting conducted within the mining tract (Block NW) to the closest identified building in the town of Alton would be well in excess of both vibration and noise regulatory thresholds. Damage to buildings may occur, and any persons in the building may experience noise levels in excess of human comfort and regulatory threshold levels (134 dB linear) from blasting.

Blasting noise and vibration calculated from the closest points of mining operation on other mining blocks (Blocks C and S) to the town of Alton indicated vibration levels below those that have the potential to damage buildings under the Proposed Action. However, vibration levels from blasting on Blocks C and S did exceed the lowest identified level for human perception within the building. Additionally, calculated noise levels from blasting on these mining blocks could exceed the threshold for human awareness (100 dB linear for noise; 0.004 inch per second for vibration), but not the threshold for building damage or human annoyance (134 dB linear for noise; 0.5 inch per second).

Impacts from blasting activities are expected to be at or below MSHA maximum limits for the safety of on-site mining personnel because it is assumed that mine operations would comply with MSHA. In addition, the blasting contractor would be responsible for pre-blast and post-blast inspections to establish the minimum safe distance from the blast, and possibly for noise and vibration blast monitoring at structures with the potential to be affected in accordance with MSHA regulations.

In addition to blasting noise and vibration calculated at receptor points, the maximum distance out to which blasting noise and vibration could be expected is calculated in the noise modeling report (see Appendix L). Table 4.2.5 presents the maximum calculated threshold distances out to which these impacts could be expected.

Table 4.2.5. Maximum Airblast Impact Distances

Airblast Threshold Value (noise)		**Impact Distance**
db Linear	**Interpretation**	**Feet (miles)**
134	Lowest threshold at which building damage and human annoyance could be expected	2,057 (0.39)
100	Barely noticeable threshold for human awareness	22,943 (4.3)
Vibration Threshold Value		**Impact Distance**
Inches per second	**Interpretation**	**Feet (miles)**
0.5	Lowest threshold at which building damage could be expected	1,407 (0.27)
0.035	Minimum noticeable threshold for human awareness (outdoors)	3,434 (0.7)
0.004	Minimum noticeable threshold for human awareness (indoors)	33,717 (6.4)

Table 4.2.5 indicates that blasting impacts from airblast overpressure (noise) and vibration under the maximum design scenario for blasting could damage buildings out to a radius from the blast epicenter of approximately 0.39 and 0.27 mile, respectively. The noise from blasting may also be noticeable out to a distance of 4.3 miles from the blast, whereas the vibration may be felt out to 0.7 mile, if outdoors. Someone who is indoors during a blasting event may notice slight disturbances to the building, such as windows rattling or objects shifting, out to a radius of approximately 6.4 miles. These building damage and disturbance levels are for the maximum blasting design scenarios from the Proposed Action, and therefore actual blasting would likely produce less noise and vibration than predicted herein.

The town of Alton, along with most of the residences and sensitive noise receptors, is within approximately 3,000 feet (0.6 mile) of the closest edge of Block NW. Many buildings in the town could, therefore, be damaged from airblast overpressure and/or vibrations from blasting on Block NW. Residents of the town would likely hear and feel the blasts, because most of the town is in the minimal noise and vibration thresholds of disturbance.

Blasting noise and vibration impacts to wildlife including sage-grouse are discussed in Section 4.18.

4.2.2.3 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

In addition to the management prescriptions and considerations common to the action alternatives and additional actions described under the Proposed Action, the tract would be reduced in size under Alternative C to exclude Block NW (the block closest to the town of Alton). In addition, the life of the mine would be 21 years rather than 25, reducing the overall noise and vibration impacts by 4 years.

4.2.2.3.1 Noise Impacts

Because surface-mining operations, including blasting, would occur further away from noise-sensitive receptors in Alton than under the Proposed Action, increases in ambient noise levels would be less than the maximum levels described under the Proposed Action. Because Alternative C excludes Block NW, the highest noise levels in the town of Alton would be 56.6 dBA L_{dn} (from mining in Block C), which is above the EPA standard of annoyance (55 dBA). Noise impacts to receptors in Bryce Canyon (0 dBA) would be the same under Alternative C as the Proposed Action. In addition, roadway impacts to Hatch and Panguitch would be the same as the Proposed Action, because coal haul activities are the same under each alternative.

4.2.2.3.2 Blasting Impacts

Because Alternative C excludes mining in Block NW (the block closest to the town of Alton), vibration impacts to the town would be reduced as compared to the Proposed Action. Under this alternative, 0.065-inch-per-second vibration levels would be felt in Alton during blasting events in Block C (closest to the town, at a 266-pounds-per-delay blast). Blasting in the portion of Block S that is closest to the town of Alton at the same intensity levels would produce vibration levels of 0.0088 inch per second (see Appendix L). This represents a reduction of 2.336 inches per second in Block C and 2.3912 inches per second in Block S when compared to modeled levels of 2.4 inches per second for Block NW.

Under Alternative C, Block C is approximately 5,000–7,500 feet (0.9–1.4 miles) away from buildings in the town of Alton. Based on these distances, blasting would not result in airblast overpressure or vibrations that could damage structures. However, noise levels modeled at 120 dB linear and vibration levels modeled at 0.065 inch per second from blasting in Block C could exceed the lowest identified thresholds (100 dB linear for noise and 0.004 inch per second for vibration) for human awareness, for both noise and vibration. In addition, the life of the mine would be 21 years rather than 25, reducing the overall noise and vibration impacts by four years.

4.2.2.4 ALTERNATIVE K1: REDUCED TRACT ACREAGE

In addition to the management prescriptions and considerations common to the action alternatives and additional actions described under the Proposed Action, under Alternative K1, the tract would be modified to exclude Block NW and Block S (see Map 2.3). In addition, the life of the mine would be 16 years rather than 25, reducing the overall noise and vibration impacts by 9 years.

4.2.2.4.1 Noise Impacts

Noise impacts to the town of Alton under Alternative K1 would be the same as for Alternative C.

4.2.2.4.2 Blasting Impacts

Blasting impacts to the town of Alton under Alternative K1 would be the same as for Alternative C.

4.2.3 Visual Resources

The analysis of impacts to visual resources is an assessment of changes to the landscape caused by the Proposed Action and alternatives. The landscape near the tract is composed of landforms, water features, vegetation, and human modifications to the land. Those modifications include structures and changes to the land, water, and vegetation. The visual resources impacts analysis provides an overview of expected visual impacts as a result of viewshed analyses conducted in the GIS (presented in Section 4.2.3.1), and as a result of a visual resource contrast analysis with discussion of BLM management objectives presented using key observation points (KOPs) in Section 4.2.3.2.

4.2.3.1 VIEWSHED ANALYSIS

The area visible from a specific location is defined as that location’s viewshed. A viewshed analysis is a computerized spatial analysis calculation performed in a GIS to determine which portions of a surrounding landscape are visible from a specific location, and vice versa. A viewshed analysis was performed for the tract and surrounding areas using digital elevation models (DEMs, raster files containing an elevation value in each cell of the grid) combined with randomized viewpoint locations. Between 6 and 10 viewshed analysis points in the tract were analyzed for the different action alternatives, resulting in viewshed maps showing visible and nonvisible portions of the landscape (see Map 3.3 and Maps 4.2–4.3) within a 15-mile radius of analyzed track boundaries. Viewshed analysis points were assigned a vertical value of 2 meters above ground elevation to account for an individual’s height while standing or traveling in a vehicle. In addition, a viewshed analysis was conducted specifically for Bryce Canyon National Park using ten points, all representing viewpoint locations along the main road that follow the western edge of the park. The results are shown in Map 4.4.

4.2.3.1.1 Alternative A: No Action

Under the No Action Alternative, ACD’s application to lease the coal included in the tract would not be approved, and the coal included in the tract would not be mined. The characteristic landscape of the tract would remain unchanged by mining.

4.2.3.1.2 Alternative B: Proposed Action

The viewshed analysis conducted for the Proposed Action used 10 viewshed analysis points positioned on higher elevation areas throughout the tract: one was at the proposed centralized facilities location, and the others were spaced to provide coverage of the proposed mining blocks (except for Block Sa). The results of the analysis (see Map 3.3 and Maps 4.2–4.4) confirm that the tract would not be visible from either

SR-89 or Bryce Canyon National Park under the Proposed Action or alternatives. Within 15 miles of the mine tract under the Proposed Action, the viewshed analysis returned approximately 26,440 acres of "seen" landscape and 542,654 acres of "unseen" landscape. The seen and unseen landscape includes places that could be seen/could not be seen from the tract, and vice versa (places that could see/could not see the tract). In addition, line-of-sight diagrams shown in Figure 4.2.4 show that the Alton Coal Tract is not visible from key viewpoints in Bryce Canyon National Park.

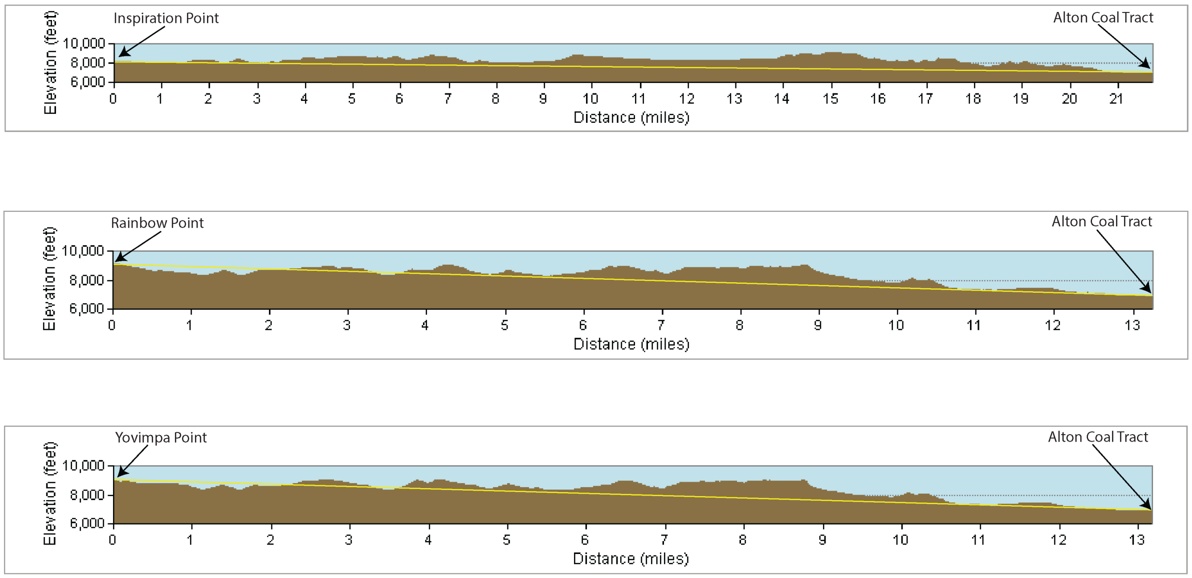

Figure 4.2.4. Elevation cross sections between points in Bryce Canyon National Park and the Alton Coal Tract.

Under the Proposed Action, the tract would be periodically visible from nonmotorized trails in the Dixie National Forest east of the tract. As shown on Map 3.3, the tract would be visible from approximately 3.7 miles of the Grand View trail and 0.9 mile of the Swapp Canyon trail. At an average walking pace of 3 mph, this equates to 1 hour and 14 minutes of impact on Grand View trail and 18 minutes of impact on the Swapp Canyon trail. The height of the surrounding vegetation cover types was not included in the viewshed analysis. Therefore, portions of the trail identified as "visible" in the analysis that also contain intervening trees or shrubbery of sufficient height and density would not be visible from the tract (and vice versa).

Under the Proposed Action, and all other action alternatives, Block Sa (186.2 acres) would not be mined and the lessee would apply pre-mining treatments to the block. The proposed vegetation treatments would aim to remove encroaching woody vegetation such as conifers and be designed to mimic natural appearing edges between vegetation types and to resemble natural openings and clearings in the vegetation patterns such that contrasts in form, line, color and texture would be avoided or minimized so as to meet VRM objectives. If heavy equipment is used to implement treatments, its presence could create visual contrasts, but these would be of short-term duration. In the long term, when stands of various aged vegetation and a less homogeneous mix of vegetation are established, the visual variety created by the Proposed Action could result in a more interesting visual landscape. Treatment areas may be noticeable to the casual observer during implementation and during the short term when dead vegetation or bare ground is visually obvious, but visual resource objectives would be met for the long term.

4.2.3.1.3 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

The viewshed analysis for Alternative C used nine viewshed analysis points: one was at the proposed centralized facilities location, and the others were spaced to provide coverage of the proposed mining blocks (except for Block Sa). Under Alternative C, the viewshed impacts would be the same as under the Proposed Action, except that tract would be periodically visible from the nonmotorized trails in the Dixie National Forest for approximately 2.8 miles (56 minutes of walking) on the Grand View trail and 0.9 mile (18 minutes) on the Swapp Canyon trail (see Map 4.2). In addition, within 15 miles of the mine tract under Alternative C, the viewshed analysis returned approximately 25, 117 acres of “seen” landscape and 533,645 acres of “unseen” landscape.

4.2.3.1.4 Alternative K1: Reduced Tract Acreage

The viewshed analysis for Alternative K1 used six viewshed analysis points: one was at the proposed centralized facilities location, and the others were spaced to provide coverage of the proposed mining blocks. The viewshed impacts would be the same for Alternative K1 as under the Proposed Action, except that tract would be periodically visible from the nonmotorized trails in the Dixie National Forest for approximately 0.9 mile (18 minutes) on the Grand View trail and 0.8 mile (16 minutes) on the Swapp Canyon trail (see Map 4.3). In addition, within 15 miles of the mine tract under Alternative K1, the viewshed analysis returned approximately 20,711 acres of “seen” landscape and 511,433 acres of “unseen” landscape.

4.2.3.2 KEY OBSERVATION POINTS FOR VISUAL RESOURCE CONTRAST ANALYSIS

For each alternative in this section, the analysis is three tiered. The first tier consists of a discussion of changes to the landscape in the tract resulting from the actions prescribed under each alternative. The second tier consists of an assessment of impacts from those same actions as seen from seven KOPs in and near the tract. The KOPs are critical viewpoints of typical landscapes in the tract that have been selected to represent the views of disturbances throughout the life of the mine and that are encountered by the greatest number of people. The third tier consists of an assessment of whether the proposed changes to the landscape would meet the BLM’s objectives for management of visual resources, as prescribed in the KFO RMP (BLM 2008b). The location and rationale for the selection of KOPs are identified below. Significant impacts would occur where the results of the Proposed Action and alternatives do not meet BLM objectives.

Seven KOPs were identified to represent typical views of the tract to residents of Alton and visitors to the surrounding area. The KOPs were selected to geographically represent views of the entire tract, to represent views from places where the greatest number of people reside, and to represent views of people traveling through the area (see Appendix N). Each KOP is described below.

KOP 1 is on KFO Route 116 on the east side of the town of Alton. This KOP represents panoramic views of the north area of the tract as seen by residents of Alton, and as seen by visitors traveling through Alton heading south on KFO Route 116.

KOP 2 is at the south end of Main Street in the town of Alton. From this location, the view is south, and looks on the area proposed for underground mining activities. This location represents views of Alton residents and views of ranchers working in agricultural fields between Alton and the tract. The views from this KOP are of agricultural fields directly south of Alton and include the mountains and rolling hills across the tract. Views are wide open and panoramic, with few obstructions.

KOP 3 is at the north end of Main Street in the town of Alton. From this location, the view is south and east and looks on a larger portion of the area proposed for mining activities compared to KOP 2. The views from this KOP are of structures in Alton and include the mountains and rolling hills across the tract. The homes, trees, and fence lines of Alton occur in the foreground. The rolling hills in the tract and surrounding mountains are in the middleground and background. Views are generally wide open, but include some obstructions in the town of Alton.

KOP 4 is along KFO Route 116 south of Alton. From this location, the view is to the north and west and looks on the broad sweeping hills of the tract. Sagebrush and sparse juniper dominate the foreground. The rugged horizon line of the surrounding low mountains and the Paunsaugunt Plateau are in the middleground and background. This location represents the views of people traveling north on KFO Route 116 through the tract.

KOP 5 is at a road junction along KFO Route 116 south of Alton. From this location, the view is to the south and looks on the broad sweeping hills of the tract. Low sagebrush, a narrow drainage channel, fence lines, patchy stands of juniper, and the curving road are in the foreground. The low and rugged horizon line of the Paunsaugunt Plateau occurs in the middleground and background. This location represents the views of people traveling south from Alton on KFO Route 116 through the tract.

KOP 6 is at a cattle guard and fence line along KFO Route 116 south of Alton. From this location, the view is to the north and looks on the town of Alton and the tree-covered terrain sweeping down into the tract. Juniper post fence lines in various directions and the curving road are in the foreground. The homes and taller trees in the town of Alton occur in the middleground. Background views are of distant, low-rising mountains. This KOP represents the views of people traveling north toward Alton on KFO Route 116 through the tract.

KOP 7 is along KFO Route 116 at the far south edge of the tract. From this KOP, the view is to the north and looks on the broad open meadows and tree-covered hills of the south portion of the tract (Block S). Fence lines, homesteads, and the curving road are in the foreground. The fans and washes descending from the Paunsaugunt Plateau appear in the middleground. Background views are of the steeper, rugged plateau itself. This location represents the views of people traveling into the tract from the south on KFO Route 116.

A visual contrast rating worksheet (BLM Form 8400-4) was prepared to analyze the effects that the proposed tract would have on the characteristic landscape, as viewed from each KOP. The analysis looked at the actions that would have the most potential to affect (change) the landscape under the action alternatives (Proposed Action, Alternative C, and Alternative K1). Those actions include surface-mining operations, installation of centralized facilities, installation of dispersed facilities, relocation of KFO Route 116, and surface rehabilitation. The analysis also looks at the actions that would continue under the No Action Alternative and how they affect the landscape. Under the No Action Alternative, existing uses and management actions would continue, including livestock grazing, back country driving, hunting, and vegetation treatments to maintain or improve livestock forage, wildlife habitat, and watershed condition, and to reduce unwanted wildfire. This analysis provides for comparison between the action alternatives and the No Action Alternative. See Appendix N for visual contrast ratings and site photographs.

4.2.3.2.1 Alternative A: No Action

Under the No Action Alternative, ACD's application to lease the coal included in the tract would not be approved, and the coal included in the tract would not be mined. The characteristic landscape of the tract would remain unchanged by mining.

Under this alternative, however, existing uses would continue. Under the KFO RMP (BLM 2008b), the BLM would continue to implement vegetation treatments in pinyon-juniper and sagebrush vegetation communities. Removal of pinyon and juniper trees and dense sagebrush would create changes in the form of each vegetation community, introducing openings in continuous stands of vegetation. The growth of shrubs and grasses in the openings of pinyon-juniper woodlands and creation of mixed-age stands of sagebrush would introduce variety in the form, texture, and color of the vegetation communities. It would also introduce noticeable curvilinear lines in the pinyon-juniper woodlands. The creation of a harmonious variety in the landscape would result in a more visually pleasing scene.

4.2.3.2.2 Alternative B: Proposed Action

Under the Proposed Action, the tract would encompass 3,576 acres, of which 2,280 acres are federal surface and mineral estate and 1,296 acres are split estate: private surface estate and federal mineral estate. Approximately 2 million TPY (MMTPY) of coal would be mined once topsoil stockpiling and initial overburden removal has occurred. Reclamation would be concurrent with mining over the course of the estimated 25-year mine life and would be followed by a minimum 10-year reclamation and revegetation monitoring period.

Surface-mining operations would result in 1,750 acres of pit disturbance occurring at different times over the life of the mine. At any time during the life of the mine, active surface operations would only involve approximately 120 acres (one open pit). Pits would be up to 200 feet deep, and the associated highwall would be up to an additional 600 feet wide. Surface-mining operations would result in a noticeable contrast in landform, line, and color as the natural topography is altered, as vegetation is removed, and as soils that are lighter in color are exposed. The low-rising hills dissected by shallow drainages throughout the tract would be altered during the excavation of pits and construction of highwalls. At any one time, up to 120 acres of rolling terrain common through the tract would be leveled, resulting in a contrasting long, straight horizontal line. Vegetation with varying shapes, colors, and heights would be cleared down to bare soil, removing those varying colors, and leaving a geometric, angular break (lines) in the vegetation. Additionally, at any one time during the 25-year mine life, closed pits would be in various stages of reclamation. Reclamation activities would reduce linear contrasts in topography by recontouring pits to a more natural sweeping line. Additionally, contrasts in texture and color of soil and vegetation would be reduced through revegetation with approved seed mixes.

Under the Proposed Action, views of the tract and areas surrounding the tract could be affected by mine-related subsidence on the tract. Estimated surface impacts due to subsidence from underground mining for all alternatives are projected to be approximately 613 acres on the tract and 166 acres outside the tract. The level of subsidence generally depends on the thickness of the coal extracted and the thickness of the overburden, as well as other geological factors. Subsidence could impact the topography of the area mined, creating visual impacts. At this time, there are not enough details known about these potential mining activities to estimate the level of subsidence that would result. The visual impact from subsidence would generally be small when compared to the surface disturbance caused by surface mining.

The centralized facilities on the tract would be constructed on approximately 36 acres of public land. These facilities would consist of an office, maintenance shop, equipment wash bay, oil and fuel storage tanks, oil and fuel storage containment, truck unloading and coal sizing area, coal stockpile area, and truck loadout area. The buildings and other facilities would result in a noticeable contrast in landform, line, color, and texture on the landscape of that portion of the tract. In the long term, vegetation clearing would introduce a break in the medium/coarse texture and color of the tract. Additionally, construction of centralized facilities would introduce boxy, geometric shapes, hard edged lines, smooth textures, and contrasting colors into the natural, rolling terrain of the tract.

Dispersed facilities necessary to conduct mining operations would consist of temporary light-use roads and haul roads, electrical poles and lines, various temporary ponds/water control structures, temporary topsoil and overburden stockpiles, and temporary berms and screens. These facilities would result in approximately 160 acres of disturbance. Construction of dispersed facilities, including roads, transmission lines, ponds and other water-control structures, stockpiles, and berms, would result in short-term changes to the landscape. Road construction would result in leveling of the landform, including some degree of cutting and filling. This would create horizontal lines and bench-like forms in the landscape. Ponds, water-control structures, and berms would introduce horizontal and angular lines and low, mesa-shaped forms to the landscape. Topsoil and overburden stockpiles would introduce angular lines and conical forms to the landscape. Vegetation clearing for road construction would introduce curvy lines through relatively dense pinyon-juniper woodlands and dense stands of sagebrush, and it would expose varying (often lighter) soil colors. Construction of power lines would introduce vertical lines to the landscape. Following mine operations, however, these facilities would be removed from the site, and disturbances would be reclaimed to their approximate original condition. In the short term, during construction, clearing would change the form and texture of vegetation cover. Currently, most of the tract has a continuous cover of varying vegetation types, including perennial grasses and low gray-green shrubs interspersed with patches of dark green pinyon pine and juniper trees. Clearing would introduce breaks in the medium-textured element of the environment. As the dispersed facilities are relocated, if vegetation with larger shrubs and trees is reestablished, the texture would return to its original condition and the change in vegetation form would revert to its original condition. If the clearings in woodlands are managed for shrubs and grasses following relocation of the dispersed facilities, changes in the form of the pinyon-juniper woodland would remain, and smaller shrubs and grasses would introduce softer textures and new colors to the landscape. These variations in the continuous vegetation cover would add variety to the landscape and new interest and appeal to the scene.

Actions proposed to prevent, minimize, and rehabilitate landscape disturbance consist of recontouring pits to a more natural topography and restoring vegetation with BLM-approved species. At any given time throughout the 25-year life of the mine, 120 or more acres would be in some stage of reclamation. The rehabilitation of disturbances by recontouring pits and planting vegetation would result in a less-developed landscape that more closely resembles the surrounding undisturbed areas.

KOP 1–3. Actions proposed in the tract under the Proposed Action that would be visible from KOPs 1, 2, and 3 consist of surface-mining activities, underground mining activities, dispersed facilities, and rehabilitation of disturbances. These actions would have the same effects on the characteristic landscape as those described above.

KOP 4. Actions proposed in the tract under the Proposed Action that would be visible from KOP 4 consist of surface-mining activities and dispersed facilities. These actions would have the same effect on the characteristic landscape as described above.

KOP 5. Actions proposed in the tract under the Proposed Action that would be visible from KOP 5 consist of surface-mining activities, centralized facilities, and dispersed facilities. These actions would have the same effect on the characteristic landscape as described above.

KOP 6–7. Actions proposed in the tract under the Proposed Action that would be visible from KOPs 6 and 7 consist of surface-mining activities and dispersed facilities. These actions would have the same effect on the characteristic landscape as described above.

Under the Proposed Action, mining and construction of related facilities would noticeably change the landscape. However, as the 120-acre tracks of coal are removed and rehabilitated, the existing character of the landscape would be gradually restored. Depending on the BLM's objectives for management of vegetation, portions of the tract would eventually return to their original vegetation communities, and other parts would be reestablished to meet other objectives. The KFO RMP prescribes vegetation treatment areas with priority given to wildlife habitat. Incorporating this plan decision into the mine reclamation plan could result in returning pinyon-juniper woodlands to a mix of woodlands with openings of sagebrush and grasses. It may also include converting old-growth sagebrush stands to a mix of age classes. These mining rehabilitation objectives would result in changes to the vegetation component of the landscape, and introduce some variety and appeal to the landscape scene. Under the No Action Alternative, no mining would occur, but the vegetation treatment objectives of the KFO RMP would continue to be implemented, resulting in the same long-term effect on the visual resources (landscape) of the tract. Thus, in the short term and mid-term, the Proposed Action would result in noticeable changes to visual resources. In the long term, the effect of the actions anticipated under the Proposed Action and the actions anticipated under No Action would have similar effect on the landscape scene—the creation of more variety and visual appeal.

4.2.3.2.3 BLM Visual Resource Inventory and Visual Resource Management Objectives

Under the Proposed Action, the level of change to the landscape was determined to be moderate to strong, based on the visual resource contrast analysis, and proposed activities were determined to be consistent with objectives. Although surface-mining activities would be apparent on the landscape, they would occur in the short term and would be reclaimed upon completion. Development of centralized and dispersed facilities would occasionally be visible on the landscape from KOPs during the active mining period. Dispersed facilities would be relocated throughout the tract during the active mining period and their disturbances reclaimed. Dispersed and centralized facilities would be entirely removed from the tract at the end of the active mining period and the disturbances reclaimed. Because the level of landscape change resulting from actions proposed under this alternative would be consistent with VRM Class IV objectives, it would not reach a level of significance. See Appendix N for visual contrast ratings.

4.2.3.3 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

Under Alternative C the tract would be modified to exclude Block NW (the block closest to the town of Alton). The modified tract encompasses 3,173 acres, of which 2,280 acres are federal surface and mineral estate and 893 acres are split estate: private surface estate and federal mineral estate.

Under this alternative, 1,662 acres of surface disturbance would occur in the tract. Of this, 1,454 acres would be the result of surface-mining operations. Centralized facilities associated with mining activities in the tract would be in the same area, would occupy the same acreage (36 acres), and would include the same items as the Proposed Action. Impacts from dispersed facilities necessary to conduct mining operations would also be the same as the Proposed Action, except that fewer acres (135 acres) would be required.

Contrasts in landform, line, color, and texture would be the same as described under the Proposed Action but would occur on 321 fewer acres (the acreage of Block NW) than the Proposed Action and over a shorter amount of time (21 years). Additionally, the tract would be modified to exclude 321 acres from mining those areas closest to Alton. This would result in less apparent contrast from KOPs in Alton due to the greater distance between Alton and the nearest disturbance. Due to sage-grouse timing restrictions, no surface-disturbing actions would be allowed between March 15 and July 15 in Block S. To allow work to continue year-round, two simultaneously open pits would be required. At any one time during the life of the mine, active and suspended mining operations would involve up to 240 acres (two pits) or double the level of visual contrast associated with the Proposed Action. Additionally, this would necessitate a 40- to 60-acre permanent EODA. In the long term, disturbances including the EODA would be recontoured and reclaimed to a more natural condition.

KOP 1–3. Actions proposed in the tract under Alternative C that would be visible from KOPs 1, 2, and 3 consist of surface-mining activities, dispersed facilities, and rehabilitation of disturbances. These actions would occur in the middleground, and because of the distance involved, the contrast would not be as apparent as under the Proposed Action.

KOP 4, 6, and 7. Actions proposed in the tract under Alternative C that would be visible from KOPs 4, 6, and 7 consist of surface-mining activities, dispersed facilities, and rehabilitation of disturbances. These actions would have the same effect on the characteristic landscape as described above.

KOP 5. Actions proposed in the tract under Alternative C that would be visible from KOP 5 consist of surface-mining activities, centralized facilities, and dispersed facilities. These actions would have the same effect on the characteristic landscape as described above.

4.2.3.3.1 BLM Visual Resource Inventory and Visual Resource Management Objectives

The level of change to the landscape in the long term under Alternative C is less than that described under the Proposed Action. Surface-mining activities would remain apparent on the landscape, but would occur over less acreage than the Proposed Action and at a greater distance from KOPs in the town of Alton. Just as in the Proposed Action, open pit mines would occur in the short term, but would cover twice the acreage at any one time in the process as the Proposed Action. Unlike the Proposed Action, an additional 40 to 60–acre EODA would be required where more than one pit is excavated. In the short term, the EODA would introduce horizontal and angular lines, a blocky, rectangular form, and a coarser texture to the landform of the landscape. Measures to restore more natural characteristics and to further reduce contrasts with the current landscape are included under this alternative and are the same as under the Proposed Action. These measures would be applied to the EODA as well as other surface disturbances. As under the Proposed Action, development of centralized and dispersed facilities would occasionally be visible on the landscape from KOPs. Likewise, resulting under this alternative, the level of landscape change would be consistent with VRM Class IV objectives, and would not reach a level of significance.

4.2.3.4 ALTERNATIVE K1: REDUCED TRACT ACREAGE

Under Alternative K1, the tract would be modified to exclude Block NW (the block closest to the town of Alton) and Block S (see Map 2.3). Under this alternative, recoverable portions of in-place coal reserves would be mined over approximately 16 years. The modified tract would reduce tract acreage to encompass 2,114 acres, of which 1,227 acres are federal surface and mineral estate and 887 acres are split estate: private surface estate and federal mineral estate.

Under this alternative, 1,005 acres of surface disturbance would occur in the tract in the form of vegetation removal. Of this, 861 acres would be the result of surface-mining operations. Centralized facilities associated with mining activities in the tract would be responsible for 36 acres of surface disturbance, whereas 92 acres would be impacted by dispersed facilities necessary to conduct mining operations. Finally, the relocation of KFO Route 116 in the tract would remove approximately 16 acres of vegetation.

Contrasts in landform, line, color, and texture would be the same as described under the Proposed Action but would occur on 745 fewer acres (the combined acreages of Block NW and Block S) than the Proposed Action and over a shorter amount of time (16 years). Additionally, the tract would be modified to exclude 321 acres from mining in areas closest to Alton. This would result in less apparent contrast from KOPs in Alton due to the greater distance between Alton and the nearest disturbance. Under Alternative K1, there would be a single open pit (approximately 120 acres), and at any one time, there would be approximately 120 acres of open surface-mining pit disturbance and an additional 120 or more acres in some stage of reclamation, the same as in the Proposed Action. Reclamation would be concurrent with mining over the course of the estimated 16-year mine life and would be followed by an up to 10-year reclamation and revegetation monitoring period, with reclamation activities potentially extended for some pits due to timing restrictions for sage-grouse. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

KOP 1–3. Actions proposed in the tract under Alternative K1 that would be visible from KOPs 1, 2, and 3 consist of surface-mining activities, dispersed facilities, and rehabilitation of disturbances. These actions would occur in the middleground, and because of the distance involved, the contrast would not be as apparent as under the Proposed Action.

KOP 4, 6, and 7. Actions proposed in the tract under Alternative K1 that would be visible from KOPs 4, 6, and 7 consist of surface-mining activities, dispersed facilities, and rehabilitation of disturbances. These actions would have the same effect on the characteristic landscape as described above.

KOP 5. Actions proposed in the tract under Alternative K1 that would be visible from KOP 5 consist of surface-mining activities, centralized facilities, and dispersed facilities. These actions would have the same effect on the characteristic landscape as described above.

4.2.3.4.1 BLM Visual Resource Inventory and Visual Resource Management Objectives

Similar to Alternative C, the level of change to the landscape in the long term under Alternative K1 would be less than that described under the Proposed Action. Surface-mining activities would remain apparent on the landscape, but would occur over less acreage than the Proposed Action and at a greater distance from KOPs in the town of Alton. As under the Proposed Action, development of centralized and dispersed facilities would occasionally be visible on the landscape from KOPs. Likewise, resulting under this alternative, the level of landscape change would be consistent with VRM Class IV objectives, and would not reach a level of significance.

4.2.4 Nighttime Lighting and the Extent of Skyglow

The analysis of impacts to the natural lightscape is an assessment of changes in brightness of the night sky caused by the Proposed Action and alternatives. A natural lightscape is characterized by the natural rhythm of sun and moon cycles, clean air, and of dark nights unperturbed by artificial lights. Changes to natural lightscapes result from changes in air quality and changes in sources of artificial lighting. See Section 4.17.4.2.5 for a discussion of the effects of nighttime lighting on wildlife.

A computer model developed by Dark Sky Partners and based on the Garstang model for calculating sky brightness arising from artificial lighting was used to assess the impacts caused by the Proposed Action and alternatives on the night skies viewed from Brian Head Peak and Yovimpa Point.

The BLM has no objectives for management of natural lightscapes or dark skies. NPS policy is to preserve the natural lightscapes of parks to the greatest extent possible. The NPS worked directly with Dark Sky Partners to verify all model input parameters, especially atmospheric clarity. It is the practice of the NPS to evaluate impacts based on the best 20% of air quality conditions as recorded during night sky monitoring. The NPS believes that such conditions provide the best opportunity for visitors to experience the view of the starry sky, and therefore that is where their cost-limited scientific efforts are focused.

For each alternative, this impacts analysis assesses whether the changes in artificial lighting and air quality would meet NPS objectives to preserve dark night skies and the natural lightscape surrounding the parks. Actions that result in a long-term reduction in night sky conditions as observed from Brian Head Peak and Yovimpa Point would result in significant impacts to the natural lightscape. The NPS considered points in Zion National Park also, however, due to its proximity to St. George, Utah and Las Vegas, Nevada night skies are brighter at Zion National Park than Bryce Canyon National Park and Cedar Breaks National Monument. In addition, most of the visitation experience in Zion National Park occurs at lower elevations and in the steep walled canyons of Zion Canyon, where the major park facilities and most popular recreational opportunities are located. Though Zion Canyon takes up only 5% of the landmass of the park, most of visitation occurs within it. This minimizes the amount of potential light pollution visible from the tract and thus the potential impact to the visitor experience. The brightness of light from the tract under this alternative would be greatest on the horizon of the nighttime sky in the direction of the mine. As a person’s view moves in an arc from the horizon to vertical overhead, the presence of the light from the tract decreases, as does its effect on the darkness of nighttime skies. Given the depth and steepness of the canyons of Zion National Park, the view of the nighttime sky is near vertical to vertical. That said, most of the park’s landmass (95%) consists of table lands: mesas and higher elevation backcountry areas that sit above Zion Canyon’s walls (Zion’s Kolob and Plateau ranger districts). These areas, though they experience lower visitation with most recreation activities requiring a backcountry permit, would be subject to a higher potential of visible light pollution from the tract as well as from other non-natural sources. Any perceived change in night sky conditions as viewed from within the canyons of Zion National Park would be proportionately less when compared with the existing conditions viewed from table lands and other lands adjacent to and within the park (Moore 2008).

The BLM received comments on the DEIS regarding the need to address impacts to skyglow from mine-generated dust, and impacts to overall sky brightness (not just to a specific sky segment). Following publication of the DEIS, the BLM reconvened the Night Sky Working Group (comprising cooperating agencies such as the NPS) to respond to comments on the DEIS, update the modeling and analysis approach and technical report, and suggest mitigation measures to reduce night sky impacts to the region and Zion National Park, Bryce Canyon National Park, and Cedar Breaks National Monument. The updated analysis in Appendix J includes impacts of mine-generated dust on skyglow as seen from Yovimpa Point, increased skyglow from population growth in the region through the year 2040, and finally a new measure, ASL, was calculated to illustrate the brightness quality of the entire hemisphere of the sky.

4.2.4.1 ALTERNATIVE A: NO ACTION

Under the No Action Alternative, ACD’s application to lease the coal included in the tract would not be approved, and the coal included in the tract would not be mined. No impacts to night sky conditions over the tract or over Bryce Canyon National Park would result from coal mining under the No Action Alternative.

Under this alternative, however, existing land uses would continue, including livestock grazing, backcountry driving, hunting, and vegetation treatments. Although it has not been quantified, PM released into the sky in smoke from prescribed fire used to treat vegetation communities would temporarily increase the diffusion of artificial light in the nighttime sky, and result in infrequent and intermittent increases in skyglow. Population growth in the region is anticipated to increase skyglow by approximately 66% by 2040 (see Appendix J). Section 4.19 provides more detail on regional impacts due to projected population growth.

4.2.4.2 ALTERNATIVE B: PROPOSED ACTION

Under the Proposed Action, surface-mining operations would result in 1,993 acres of surface disturbance occurring at different times over the estimated 25-year mine life. Surface-mining operations and motorized travel through the tract would result in artificial nighttime lighting combined with increased airborne PM.

4.2.4.2.1 Artificial Lighting Sources

Three types of artificial lighting sources proposed for use during nighttime operations are discussed in this analysis: 1) portable lighting towers for use at the mine pit during active nighttime mining; 2) fixed light towers to be used for lighting centralized mine facilities; and 3) mobile light sources generated by vehicles, mining equipment, and flashlights. One to six portable light towers would be located at each active pit. Portable light towers would be diesel powered with approximately four individually shielded metal halide (MH) lamps per tower. Each portable light tower would be approximately 30 feet tall, oriented approximately 30 degrees from the horizontal down toward the ground, and would be moved in accordance with the mining sequence. Four to six fixed-position light poles would be permanently located at the 36-acre centralized mine facilities for the life of the mine. Fixed-position light poles would have a similar height and orientation as the portable light towers but would use fully shielded lamps (Figure 4.2.5). Additionally, mobile equipment lighting would come from headlights, brake lights, flashlights, and other safety lighting on mechanical equipment used during nighttime mining operations.

4.2.4.2.1.1 Lamp Shielding and Aiming

Lamp shielding and aiming reduce uplight, light spill, and light trespass. A fully shielded light fixture is a light fixture constructed in such a manner that all light emitted by the fixture is projected below the horizontal, typically by placing a barrier at the top of the fixture above the lamp (bulb) (Davis 2013) (Figure 4.2.5). Aiming light simply means to position the lamp in such a way that light travels in a specific direction and highlights a targeted object or work surface. In addition, certain lamp types are better at aiming than others. Fully shielding fixtures is considered a type of aiming, because fully shielded fixtures aim the lamp's light toward the ground and below the horizontal.

Figure 4.2.5. Differences in unshielded and fully shielded lamps[2] (Davis 2013).

Three scenarios are used in this analysis to describe potential impacts to sky brightness across a range of nighttime lighting scenarios from Yovimpa Point, which is in Bryce Canyon National Park approximately 21 km from the tract. The current three-scenario approach evolved from the prior analyses' two approaches (referred to as the "typical case" and the "brightest case") to add a third, brighter case (see notes below):

1. Scenario 1 assumes the least lighting with one portable light tower (4 lamps), four fixed-position light towers, and 20 lamps from mobile light sources (this is referred to as the "typical case" in prior analyses).
2. Scenario 2 assumes a mid-range of lighting with three portable light towers (12 lamps), six fixed-position light towers, and 36 lamps from mobile light sources (this is referred to as the "brightest case" in prior analyses).

[2] The intent of the photographs presented in Figure 4.2.5 is to illustrate the general concept of lamp shielding. The reduction in light from fully shielding lamps in the photograph does not represent the amount of light reduction that would result from shielding lamps on the mine tract.

3. Scenario 3 assumes the most lighting with six portable light towers (24 lamps), six fixed-position light towers, and 36 lamps from mobile light sources.

Portable and fixed-position light towers would result in the greatest addition to artificial light under the Proposed Action. Fixed-position lights at the centralized mine facilities would use 250-watt MH lamps producing up to 25,000 lumens each. The fixed lights would be fully shielded, and no light would be emitted upward. The portable lights would use 1,000-watt MH lamps producing 110,000 lumens each and partially shielded. MH lamps are the most commonly used lamp at mine sites. Despite having the highest impact to skyglow as compared to other lamp types in regard to visual astronomical observation, they are ideal for use in mine pits due the color rendition provided, which is critical to safety. MSHA safety regulations require adequate nighttime lighting (see Section 4.2.5). Portable lights are adjustable, allowing them to be aimed in different directions and at different angles relative to the horizon. For the purpose of analysis, Dark Sky Partners assumed that portable lights would typically be aimed at 30 degrees below the horizon, directing 30% of light upward (see Appendix J) for Scenario 1. In contrast, the brighter case scenarios (2 and 3) consider that the portable lights are aimed horizontally more of the time, producing a larger uplight fraction (0.50). Equipment and vehicle lighting would represent a small contribution to artificial lighting.

Each scenario described above characterizes night sky brightness from zenith angles from 80° to 89° to the horizon in the direction of the mine from Yovimpa Point. A zenith angle of 80° corresponds to an altitude of 10° above the horizon, and a zenith angle of 89° corresponds to an altitude of 1° above the horizon. See Table 4.2.6 for a calculation of total lumens and percentage increase in night sky brightness under each scenario and Figure 4.2.6 for a depiction of lumens uplight sources.

Table 4.2.6. Nighttime Lighting Scenarios: Percentage Increase in Sky Brightness

Scenario	Total Initial Lumens from Portable, Mobile, and Fixed Sources	Uplight Lumens Output from Portable*, Mobile†, and Fixed‡ Sources	Downlight Lumens Output from Portable, Mobile, and Fixed Sources	Uplight Reflection Lumens Output	Net Uplight Lumens Output¥	Percentage Increase in Sky Brightness at Zenith Angle of 80° (10° above the horizon)	Percentage Increase in Sky Brightness at Zenith Angle of 89°(1° above the horizon)§
1	740,000	154,000	586,000	87,900	241,900	1%	10%
2	1,830,000	699,600	1,130,400	169,560	869,160	3%	31%
3	3,150,000	1,359,600	1,790,400	268,560	1,628,160	8%	136%

* Uplight fraction for portable light towers is 0.301 (for Scenario 1) or 0.0502 (for Scenarios 2 and 3).

† Uplight fraction for mobile light sources is 0.11.

‡ Uplight lumens for fixed light towers (uplight fraction of 0.00) would be 0 lumens in each scenario.

¥ Net uplight lumens are calculated by adding uplight lumens output and uplight reflection lumens output.

§ Results at extreme zenith angles are increasingly less robust.

The first scenario of lighting conditions would brighten the sky by approximately 1% at a zenith angle of 80° (or an altitude of 10° above the horizon), increasing to 10% at a zenith angle of 89° (1° above the horizon). Lighting Scenario 2 would brighten the sky by approximately 3% at an altitude of 10° above the horizon and 31% at 1° above the horizon. The last and brightest scenario (3) would increase sky brightness by approximately 8% at an altitude of 10° above the horizon and 136% at 1° above the horizon (see Appendix J).

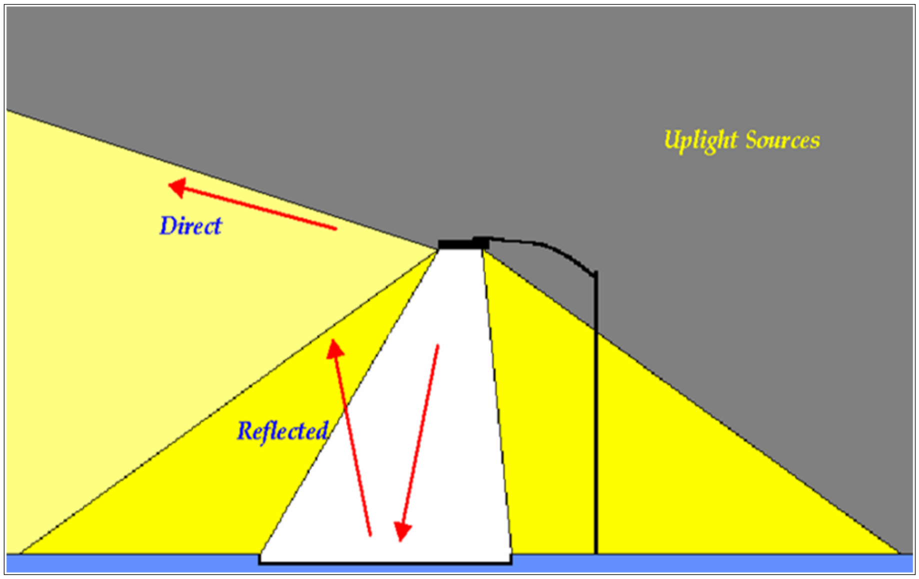

Figure 4.2.6. Uplight sources[3].

4.2.4.2.2 Particulate Matter

PM from surface-mining actions on up to 120 acres at any given time and from motorized travel on dirt surface roads could impact skyglow. Carr (Carr 1989) states that the addition of dust further diffuses artificial lighting through the night sky, resulting in a less bright but more extensive skyglow (Carr 1989).

As a result of comments received on the DEIS, Dark Sky Partners modeled impacts to skyglow as seen from Yovimpa Point from dust expected to be generated by tract operations. The computer code was modified to model mine-generated dust as being a cylinder over the mine pit assumed to be 1 km in radius, 200 meters high, and centered over the mine pit. The model also increased the particulate component of the atmosphere within this cylinder relative to the surrounding atmosphere. For the purposes of including dust, the cylinder was assumed to have a K value of 2 (a K value is the parameter that describes the amount of aerosol [particulates] in the atmosphere). A K value of 2 was chosen to represent increased dust from the mine because it is representative of other mine scenarios. The K value of the surrounding air was set to 0.05, which is representative of the exceptionally clear skies in the region (0.05 is an NPS-measured value and was used in Dark Sky Partners's 2009 model; see Appendix J). The average western air has a K-value ranging from approximately K = 0.3–0.5.

As detailed in the updated report in Appendix J, the addition of dust over the tract would cause a slight decrease in the predicted overall sky brightness, and a slight increase in predicted sky brightness directly above the tract. This is compared to the predicted increase in overall skyglow without dust enhancement over the tract in Dark Sky Partners's original report (see Appendix J). The change in skyglow due to the

[3] Figure 4.2.6 is presented to illustrate various uplight sources conceptually and is not intended to represent the various uplight angles from various mine light sources described in the text.

addition of dust would be very small for all zenith angles, resulting in a predicted reduction in the sky brightness increase at a zenith angle of 89º toward the tract from 10% to 9.7% (a decrease of 0.3%) for lighting Scenario 1, from 31% to 30% (a decrease of 1%) for Scenario 2, and from 64% to 62% (a decrease of 2%) for Scenario 3 (DSP 2014). In terms of impacts to Bryce Canyon, it is expected that the dust over the tract would increase the brightness of the sky above the tract as seen by observers at Yovimpa Point due to increased scattering of light (see Appendix J).

4.2.4.2.3 Average Sky Luminance

ASL was calculated to illustrate the brightness quality of the entire hemisphere of the sky instead of just a particular segment of the sky. The fundamental quantity that the ASL calculates is the luminance of the sky as seen from the observer's location. Luminance is the brightness per unit area of the sky (typically measured in units of nanoLamberts (nL), or mag/arcsec^2). The computer code calculates this luminance on a grid of positions covering the hemisphere of the sky, and a separate calculation then integrates over the grid to find the ASL. For Yovimpa Point calculations, the grid was set with 80 points uniformly spaced in azimuth (0–360 degrees) and 20 points in elevation (0–90 degrees), for a total of 80 × 20 = 1,600 points (see Appendix J). The calculated ASL can be compared with one derived from measurements made by the NPS night sky team as described below. The results are shown in Table 4.2.7.

Table 4.2.7. Average Sky Luminance in NanoLamberts for 2010 Conditions (no mine), Three Cases with Mine Lighting using 2010 Population Numbers, and Two Future (2040) Cases showing both Standard and Optimistic Parameters for 2040 Town Lighting

Scenario and Parameters	Natural Lighting	Mine Lighting	Lighting from Towns	Total Artificial Lighting	Total Present Lighting	Total Percentage Lighting Increase over Present	Total Percentage Lighting Increase over Natural
2010, no mine	71.19	0.00	1.92	1.92	73.11	0.0%	2.7%
2010, ACT Scenario 1	71.19	0.14	1.92	2.06	73.25	0.2%	2.9%
2010, ACT Scenario 2	71.19	0.52	1.92	2.44	73.63	0.7%	3.4%
2010, ACT Scenario 3	71.19	0.99	1.92	2.91	74.10	1.4%	4.1%
2040, ACT Scenario 2, standard parameters	71.19	0.52	4.01	4.53	75.72	3.6%	6.4%
2040, ACT Scenario 2, optimistic parameters	71.19	0.52	2.91	3.43	74.62	2.1%	4.8%
2040, ACT Scenario 3, standard parameters	71.19	0.99	4.01	5.00	76.19	4.2%	7.0%
2040, ACT Scenario 3, optimistic parameters	71.19	0.99	2.91	3.90	75.09	2.7%	5.5%

The NPS estimate of the ASL due to artificial lighting at Yovimpa Point shows significant uncertainty due primarily to uncertainty in the natural skyglow, which varies both temporarily and spatially. Subtracting the natural skyglow model developed by the NPS from their Yovimpa Point observations to find the ASL contribution from towns gives values ranging from 1.1 nL to 5.4 nL, depending on the estimate used for the natural airglow. Hence, the Dark Sky Partners modeled value of 1.92 nL for the 2010 towns' contribution is within the range of the NPS estimate. See Appendix J for more detail.

The Air Resources section of Chapter 4 has been updated in the SDEIS to include elemental carbon (EC) in the calculations related to PM. As discussed in this section, the maximum impacts inside of Bryce Canyon National Park from increases in PM and NO_x associated with potential mine plumes under the Proposed Action would be less than the VISCREEN acceptance criteria for both color change (Delta E) and contrast (see Table 4.3.14).

4.2.4.2.4 Viewshed Analysis and Nighttime Lighting

To address the concern over the potential direct visibility of light fixtures in the tract from Bryce Canyon National Park and Cedar Breaks National Monument, a viewshed analysis was performed in the GIS to determine which parts of the tract are visible from Yovimpa Point and Brian Head Peak, and vice versa.

The results of this analysis show that no part of the tract is directly visible from Yovimpa Point or any part of Bryce Canyon due to intervening terrain, and thus no light fixtures used on the tract would be directly visible from Bryce Canyon.

The analysis shows, however, that a portion of the proposed mining tract is directly visible from Brian Head Peak near Cedar Breaks National Monument and more importantly from portions of the Markagunt Plateau in the northeast portion of the monument itself. Light fixtures used in these portions of the tract could therefore be directly visible from within the monument. The partially shielded, portable fixtures particularly, using 1,000-watt 110,000 lumen lamps, would almost certainly be the brightest artificial light sources visible in the night landscape. Although a precise calculation of the brightness of these lights would require detailed specification of the fixtures' photometric properties, aiming configuration, and other details, an order-of-magnitude calculation yields that the lights would appear significantly brighter than the planet Venus, the brightest object in the night sky after the moon. This calculation assumes lighting Scenario 2 and assumes that the lights are pointing toward Brian Head Peak. Under lighting Scenario 3, impacts would be doubled, because the number of lamps from portable light sources is doubled. However, there would only be a fractional increase in sky brightness over the baseline condition visible from Brian Head Peak. In fact, lighting Scenario 1 is fainter than all other artificial light sources visible from Brian Head Peak and considered in the study. Any impacts to Brian Head Peak and portions of the Markagunt Plateau as a result of portable lighting tower glare would be addressed at the permitting stage through a detailed mine lighting plan.

When portable lights are in place and pointed at Cedar Breaks National Monument, the impact to visitors is likely to be minor to moderate; however, because of the intermittent nature of these lights and their visibility, and the fact that glare would be visible in limited locations, the overall impact to Cedar Breaks National Monument would be negligible (NPS 2009b).

It is also expected that, at times, direct glare would be visible from Brian Head Peak in addition to other locations in the Dixie National Forest. In addition, the effects of direct glare would be reduced through the use of directional lighting and by installing shields on lights.

Additionally, as portable lights are located at pits adjacent to the town of Alton, some residents throughout the town may be impacted by glare from direct lighting. Glare would be reduced through the use of directional lighting and by installing shields on lights. Glare would also be reduced by placing portable lights in the pit disturbance using the change in terrain resulting from mining activity to block any potential direct lighting on the town of Alton.

The study conducted by Dark Sky Partners (included as Appendix J) concludes that the predicted skyglow visible from Yovimpa Point in Bryce Canyon National Park would be less than that produced by several small towns in the general area. The study also concluded that the predicted skyglow visible from Brian Head Peak outside of Cedar Breaks National Monument would be much less than skyglow arising from

St. George and Cedar City, Utah. Although the impacts of the Proposed Action would not reach a level of significance, there is a high value placed on night sky resources at Bryce Canyon. The mitigations listed in Section 4.2.5 are recommended to further reduce impacts to night sky conditions.

4.2.4.3 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

Under Alternative C, centralized facilities associated with mining activities on the tract would be located in the same area, occupy the same acreage (36 acres), and include the same artificial lighting sources as the Proposed Action. Artificial lighting associated with dispersed facilities necessary to conduct mining operations would also be the same as the Proposed Action, except that fewer acres (135 acres) would be required. Impacts to natural lightscapes would be the same as those described under the Proposed Action, except that they would occur over a shorter timeframe of 21 years (the life of the mine under Alternative C).

4.2.4.4 ALTERNATIVE K1: REDUCED TRACT ACREAGE

Under Alternative K1, the tract would be modified to exclude Block NW (the block closest to the town of Alton) and Block S (see Map 2.3). Under this alternative, recoverable portions of in-place coal reserves would be mined over approximately 16 years. The modified tract would reduce tract acreage to encompass 2,114 acres, of which 1, 227 acres are federal surface and mineral estate and 887 acres are split estate: private surface estate and federal mineral estate.

Under Alternative K1, centralized facilities associated with mining activities on the tract would be located in the same area, occupy the same acreage (36 acres), and include the same artificial lighting sources as the Proposed Action. Artificial lighting associated with dispersed facilities necessary to conduct mining operations would also be the same as the Proposed Action, except that fewer acres (92 acres) would be required. Impacts to night skies would be the same as the Proposed Action, except that they would occur over a shorter timeframe of 16 years (the life of the mine under Alternative K1).

4.2.5 Potential Mitigation Measures

Table 2.6.1 in Section 2.6.1.9 describes a number of BMPs and design features that are required and included as part of the action alternatives for the Alton Coal Tract, including the requirement that a detailed nighttime lighting plan be prepared as part of the mine permitting stage. The design features and BMPs are environmental protection measures, actions, or practices that are part of the Proposed Action and all action alternatives and would be implemented by the lessee. Potential mitigation measures are additional means, measures, or practices not incorporated into the Proposed Action or alternatives as design features (or BMPs) that would further reduce or eliminate impacts. In considering mitigation measures for aesthetic resources, it should be noted that measures to reduce dust are included as design features in the air resources Section 4.3.1, and are therefore not discussed below.

4.2.5.1 POTENTIAL SOUNDSCAPE MITIGATION MEASURES

The following soundscape mitigation measures are discretionary, and if prescribed as conditions of the ROD (in the form of stipulations on the lease), they would further reduce impacts to aesthetic resources:

- Reduce nighttime hours of operation in certain areas of the mine; a 10-dBA penalty is added to operation that occurs between 10:00 p.m. and 7:00 a.m.
- Use equipment with lower sound power levels than the ones that were modeled.
- Build a noise attenuating wall.
- Use the noisiest equipment in areas where natural topographic buffers, distance from sensitive noise areas, and/or noise attenuating walls can be used to lower the overall noise levels.

- Use smaller blast charges in mining operations than the maximum levels used to produce the numbers in Table 4.2.5.
- Conduct mine blasting at greater distances from the town of Alton.
- Conduct pre-blast surveys to identify buildings potentially vulnerable to airblast and/or vibration.
- Conduct noise and vibration blast monitoring at vulnerable buildings and sensitive resource areas, including within Bryce Canyon National Park.

4.2.5.2 POTENTIAL VISUAL RESOURCE MITIGATION MEASURES

Though it would not reduce visual impacts of mining, the following visual resource mitigation measure would promote greater public understanding of mining and minerals development and would therefore serve a compensatory purpose:

- To promote public understanding, place interpretive signs at overlooks along USFS (Dixie National Forest) trails that describe the mining and rehabilitation activities.

4.2.5.3 POTENTIAL NIGHT SKY MITIGATION MEASURES

Potential light pollution mitigation recommendations are summarized below following a detailed discussion of a variety of mitigation approaches and MSHA safety requirements in regard to adequate mine lighting. Potential mitigation measures include specifying lamp types and using operational controls (such as dimmers, timers, motion sensors, and directional lighting) to promote efficient lighting usage at facilities.

4.2.5.3.1 MSHA Safety Regulations

Table 4.2.8 and Section 4.2.1 outline MSHA safety regulations with regard to mine lighting. Any mitigation recommendations must be consistent with identified lighting needs and regulations. The key phrase in these regulations, “Illumination sufficient to provide safe working conditions” implies that a) conditions need to be bright enough to work safely; b) lamp types used in work areas must emit a full spectrum of light necessary for color rendition, which is necessary for safety; and c) lights must be in operable working condition with an adequate backup system, so that there is always lighting available.

Table 4.2.8. MSHA Mine Lighting Safety Regulations

Statute/Reference	Detail
30 CFR 56.17001 (MSHA) Illumination of surface working areas	Illumination sufficient to provide safe working conditions shall be provided in and on all surface structures, paths, walkways, stairways, switch panels, loading and dumping sites, and work areas.
30 CFR 77.207 (MSHA) Illumination	Illumination sufficient to provide safe working conditions shall be provided in and on all surface structures, paths, walkways, stairways, switch panels, loading and dumping sites, and working areas.

4.2.5.3.2 Lamp Types

Six lamp types under consideration for use in the mining context are low-pressure sodium (LPS), narrow band amber light–emitting diode (ALED), high-pressure sodium (HPS), filtered white light–emitting diode (FLED), white light–emitting diode (wLED), and MH. Three of these are considered “traditional” mine lighting lamp types (LPS, HPS, and MH) and are considered high-intensity discharge (HID) lamps, whereas the LED family has only in recent years been developed for outdoor lighting application. Sources such as LPS, HPS, and MH are the most common type of outdoor lighting. This is because they have dominated outdoor lighting for many decades, are inexpensive, and efficiently produce abundant light (Monrad Engineering 2012). However, Monrad considers the HID family of lamps to be inferior to more modern LED lamp types (Monrad Engineering 2012). See Section 4.2.5.3.2 for a discussion of these lamp types in relation to operational controls.

The impacts of the six lamp sources on the visual character of the night in general and on visual astronomical observation in particular—as are relevant in the Bryce Canyon National Park region— depend on the relative visibility of skyglow caused by the various lamp sources. Ranked from lowest to highest impact, the six lamp sources and their contribution to visual skyglow relative to LPS are shown in Table 4.2.9.

Table 4.2.9. Lamp Type Contribution to Skyglow

Lamp Type	Skyglow Brightness Measure Relative to LPS*	Relative Contribution to Skyglow as it impacts Visual Astronomical Observation
LPS	1.0	Lowest
ALED	1.0	
HPS	2.6	
FLED	3.7	
wLED	4.4–8.0[†]	
MH	6.4[‡]	Highest

[*] Skyglow impact ratios presented above are based on scotopic brightness as viewed near the light source; at distances over several kilometers the ratios decrease, and depend on many factors including distance, aerosol load, and viewing angles.

[†] Values shown are for wLED with correlated color temperature of 2400K and 5100K.

[‡] Value is for MH with correlated color temperature of 4100K.

Source: Luginbuhl et al. (2013; 2013).

In cases where color rending is not critical to the task, the environmentally preferred options become the amber sources, LPS, and ALED. These lighting sources produce the least light pollution because they emit only yellow wavelengths, causing the lowest skyglow brightness when observed by the human eye at the low luminance of the night sky. That said, with these sources, the color spectrum is reduced to only one wavelength or a very limited spread of wavelengths, and the ability of the human eye to perceive color differences is lost. Mine areas where LPS or ALED lamps might be employed exclusively are those areas where color rendition is not critical to the task or safety, such as employee parking, storage, and central facilities outdoor lighting.

In areas of the mine where color rendition is needed, lamp types that produce a wider color spectrum should be used as all or a portion of the lighting to provide color rendition (Boynton et al. 1989). These lamp types include HPS, MH, wLED, and FLED. HPS is the lamp type with the second lowest skyglow impact at 2.6 times LPS, and though it is a yellow-rich source, it provides substantial color rendition. MH and wLED lamps (MH are the most commonly used lamp at mine sites) result in the highest impact to skyglow at 4.4–8.0 times that of LPS and 1.7–3.1 times that of HPS. FLEDs cause an intermediate skyglow that appears 3.7 times brighter than LPS and 1.4 times brighter than HPS, yet notably less skyglow than conventional wLEDs and MH. Even in applications where color rendition is needed, consideration should be given to producing as much light as possible (taking into account safety requirements) using amber sources (LPS, ALED) with a mix of 10% or more of the light provided by wide-spectrum sources such as HPS, FLED, MH or wLED (Boynton et al. 1989). Such a mixed-source design can provide the needed color perception while minimizing environmental impact.

If insect attraction and other biological disturbance are of primary concern, LPS and ALED are preferred over HPS and FLED, and FLED is preferred over wLED and MH. FLEDs are an advantageous option when good color rendering is necessary for safety or task purposes.

4.2.5.3.3 Operational Controls

One of the easiest ways to reduce unwanted nighttime light pollution is to use adaptive lighting controls to dim or extinguish lighting when not needed, and to provide ‘instant on’ capabilities for emergency or operational lighting. HPS, MH and LPS, however, do not perform well when dimmed below maximum output and generally require warm up and cool down periods between uses (sometimes taking several minutes to restart), and may cause unsafe working conditions as a result. In contrast, LEDs can be easily turned on and off, do not present start or restart delays, and perform well when dimmed. Therefore, LEDs (ALED, FLED, or wLED) are preferred where lighting needs require dimming lights, extinguishing lights when not needed, or ‘instant on’ capabilities for emergency or operational lighting (Monrad Engineering 2012).

4.2.5.3.4 Potential Night Sky Mitigation Measures

The following night sky mitigation measures would further reduce impacts to aesthetic resources:

- In areas of the mine where there is a need for color rendition, use the minimum amount of white-spectrum lamps such as FLED or HPS lamps rather than MH lamps.
- In areas of the mine where color rendition is not important, use LPS or ALED lamps.

  In the event that MH lamps are used, lamps should be 3400K or less correlated color temperature (warm-white).
- Place motion sensors on outdoor lighting fixtures for dimming or extinguishing capabilities while not in use.
- Keep partially shielded portable light fixtures in the mine pit below the ground surface, and aim them approximately 30º or more below the horizon and away from Bryce Canyon National Park, Cedar Breaks National Monument, and Brian Head Peak.
- Operate no more than six portable light towers at one open pit at any given time.
- Paint or stain mine-related buildings to produce flat-toned, nonreflective surfaces, which would have minor, beneficial impacts on dark skies by reducing the potential for building related reflected night lighting.

4.2.6 Unavoidable Adverse Impacts

The Proposed Action and alternatives would result in unavoidable adverse impacts to aesthetic resources even following implementation of protective measures and the mitigation measures described above.

Although BMPs and required mitigation measures would result in a reduced increase in ambient noise levels relative to noise-sensitive receptors, increased ambient noise levels from truck traffic, blasting, and other heavy machinery would still occur for the duration of mining activities. The changes to landform, vegetation, and structures on the landscape from pit disturbances and construction of facilities would be evident in the natural landscape of the tract and surrounding lands, even with mitigation. Following reclamation, the landform would be restored to a near-natural condition, centralized and dispersed facilities would be removed, and a more varied vegetation pattern would be rehabilitated. Reclamation would restore the existing landscape following mining. Even with mitigation, the addition of artificial lighting in the tract and the added airborne PM (dust) would result in greater light pollution and skyglow over the tract and surrounding lands.

4.2.7 Short-term Uses versus Long-term Productivity

As discussed throughout this section, there would be a short-term loss of the aesthetic resources in the tract over the 25-year mine life under the Proposed Action, the 21-year mine life under Alternative C, and over the 16- year mine life under Alternative K1. Effective implementation of required BMPs and protective measures described in Chapter 2, as well as prescribed mitigation measures identified in Chapter 4, would prevent these short-term uses from substantially impacting the long-term quality of aesthetic resources. Even with mitigation, increased levels of noise and decreased darkness of nighttime skies would result.

4.2.8 Irreversible and Irretrievable Commitments of Resources

The BMPs and protective measures detailed in Chapter 2 require the reclamation of disturbed areas following completion of mining operations under either action alternative. Because surface disturbances (including the EODA under Alternative C) would be recontoured and vegetation resources would be reclaimed, there would be no anticipated, irreversible impacts on visual resources associated with the actions proposed for the tract. Additionally, because noise and light pollution would only occur for the duration of the mining operations, there would be no irreversible impacts on soundscapes and lightscapes. There would, however, be irretrievable impacts associated with surface-disturbing activities proposed throughout the tract. The changes in landscape, soundscapes, and lightscapes that would result are an irretrievable loss of these aesthetic resources until mining operations are completed and successful reclamation takes place.

4.3 Air Resources

The analysis area for air resources consists of an approximately 150-km area surrounding the Alton Coal Tract (see Map 3.5). It is also referred to as the *dispersion model domain*. A series of technical analyses was performed to assess potential impacts on ambient air quality in the air analysis area from mining on the tract and transportation of coal along the reasonably foreseeable transportation route; these analyses have been expanded and updated in the SDEIS to address the addition of Alternative K1 and responses to public comments on the DEIS. The SDEIS air analyses are based on the assumption of an overburden removal of no more than approximately 200 feet, which is specified as a design feature as described in Section 1.1 and Table 2.6.1. The following are addressed quantitatively or qualitatively in these analyses:

- Mine construction–related emissions
- Mine operation–related emissions
- Impacts to attainment of the NAAQS for the tract
- PSD review
- AQRV: visibility impacts to the Class I areas, acid deposition, flora, and fauna
- General conformity

The analyses were based on a conceptual mine design, operating assumptions, and a set of design features to be implemented by the lessee. Although the analyses are intended to be conservative to accommodate foreseeable emissions under various mining scenarios, a detailed mine plan has not yet been developed. An approved, detailed mine plan would be subject to state permitting requirements and to appropriate dispersion modeling at that time, as well as to detailed operation and mitigation measures. Technical aspects of the air resources analysis are addressed in more detail in the *Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* (included in Appendix K) and the *Supplement to Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* (included in Appendix K).

4.3.1 Design Features

As described in Section 2.6.1.9, design features are environmental protection measures, actions, or practices that are part of the Proposed Action and all action alternatives and would be implemented by the lessee. For air resources, design features or emission controls included in the emission inventory calculations consist of the following:

- Watering or using a combination of chemical suppressants and watering to reduce fugitive dust from unpaved roads and disturbed areas (dust control efficiencies are in Table 4.3.1, below.)
- Watering before predicted high-wind events to reduce windblown dust from portions of the tract, overburden storage piles, and coal storage piles
- Enclosing most coal transfer points and processing activities during coal production to reduce fugitive dust emissions (dust control efficiencies are in Table 4.3.1, below.)
- Using ultra-low sulfur diesel fuel (15 ppm) for nonroad vehicles and generators
- Using generators and nonroad diesel engines that meet Tier 4 emissions standards
- Using post-combustion controls on nonroad vehicles

The use of chemical suppressants can affect air quality characteristics in several ways. Dust suppressants that adhere to soil particles can be re-entrained into the air with strong winds, potentially adding contaminants to the air in addition to PM. Dust suppressants have little efficacy at suppressing small respirable dust; they may be harmful because smaller dust particles (less than 10 μm) can be inhaled directly into the lungs. In addition, some dust suppressants may contain VOCs that can be dispersed into the air when the product is applied (which is a particular concern in the formation of O_3). These potential impacts vary greatly due to physical and chemical differences from site to site, dust suppressant composition, and application techniques (EPA and UNLV 2004).

The design features discussed above, as well as project design assumptions for emission calculations, are summarized in Table 4.3.1.

Table 4.3.1. Design Features and Project Design Assumptions for Emission Calculations for the Alton Coal Tract

Feature	Parameter	Units
Reasonable Maximum Year of Mining Activities		
Construction duration	6	Months
Construction acreage disturbed	6	Acres/month
Topsoil thickness	12	Inches
Topsoil density	3,000	Pounds per cubic yard
One-way topsoil haul distance	0.85	Mile
Topsoil haul road control efficiency	70	%
Scraper capacity	22	Cubic yards
Scraper empty weight	36	Tons
Scraper travel (on haul roads)	4,473	Trips per year
Topsoil haul road silt content (scrapers)	16	%
Topsoil/overburden/coal haul road silt content	4.8	%
Topsoil front-end loader capacity	12	Cubic yards
Topsoil haul truck capacity	100	Tons
Topsoil haul truck empty weight	80.4	Tons
Topsoil haul truck travel	1,476	Trips per year
Overburden thickness	200	Feet
Overburden hauled	13,117,440	Tons
Overburden density	2,562	Pounds per cubic yard
Overburden moisture	7.9	%
Overburden silt content	7	%
Average annual wind speed	7	mph
Average annual daytime wind speed	8.1	mph
One-way overburden haul distance	0.75	Mile
Overburden haul road control efficiency	85	%
Overburden haul truck capacity	420	Tons
Overburden haul truck empty weight	307	Tons
Number of overburden haul trucks	2	–
Overburden haul truck loading/unloading	3.6	Trips per hour
Annual acres disturbed (Proposed Action)	61	Acres per year
Annual acres disturbed (Alternative C)	61	Acres per year

Table 4.3.1. Design Features and Project Design Assumptions for Emission Calculations for the Alton Coal Tract

Feature	Parameter	Units
Annual acres disturbed (Alternative K1)	61	Acres per year
Effective control efficiency on new disturbance	90	%
Coal thickness	16	Feet
Coal density	2,300	Pounds per cubic yard
Coal moisture	10.4	%
Coal silt content	8.6	%
Coal haul truck capacity (at mining operation)	100	Tons
Coal haul truck empty weight	80.4	Tons
One-way coal haul distance (on-site)	1	Mile
Coal haul road control efficiency	85	%
Coal loading into mine trucks	2	MMTPY
Coal dumping (at crusher)	2	MMTPY
Coal crushing/screening/conveying	2	MMTPY
Coal processing control efficiency	95	%
Coal storage	150,000	Tons
Coal storage surface area	170,000	Square feet
Coal storage control efficiency	90	%
One-way coal haul distance (off-site)	110	Miles
On-road haul truck capacity	43.3	Tons
On-road haul truck empty weight	20.95	Tons
Coal loading into over-the-road trucks	2	MMTPY
Coal loading into over-the-road trucks control efficiency	95	%
Coal dumping (at railhead)	2	MMTPY
Coal storage control efficiency (loadout)	90	%
Coal loading (trains)	2	MMTPY
Coal loading into trains control efficiency	95	%
Access road length	2.5	Miles
Access road silt content	4.8	%
Access road control efficiency	85	%
Average vehicle weight (employees)	2.5	Tons
Number of employees	160	–
Employee round-trip distance	60	Miles
Number of graders	2	–
Grader speed	3	mph
Grader operating hours	10	Hours per day
Grader control efficiency	55	%
Number of water trucks	2	–

Table 4.3.1. Design Features and Project Design Assumptions for Emission Calculations for the Alton Coal Tract

Feature	Parameter	Units
Water truck capacity	10,000	Gallons
Number of blasts	62	Blasts per year
Area per blast	1,000	Square meters
Number of bulldozers	5	–
Number of front-end loaders	1	–
Number of service vehicles	10	–
Service vehicles travel	20	Miles per day
Service vehicles weight	4	Tons
Service vehicles control efficiency	85	%
Electric power shovel	36	Cubic yards
Generating power capacity (facility)	2,000	Kilowatts
Generating power capacity (underground mining)	3,000	Kilowatts
Hydraulic backhoe	1	–
Paved road silt loading	0.2	Grams/square meter
Employee vehicle weight	2	Tons
Ammonium nitrate/fuel oil use	0.6	Pounds per cubic yard
Overburden blasted	1,000,000	Cubic yards
Diesel fuel density	7.05	Pounds per gallon
Diesel fuel sulfur content	15	ppm
Operating hours	8,760	Hours per year
Construction Phase		
Duration	6	Months
Acreage	36	Acres
Acres per month	6	Acres
Total suspended particulate emission factor	1.2	Tons per acre-month

The following design features would be reflected in lease stipulations to address impacts to air quality and AQRVs (each design feature is also identified with the applicable pollutant it would address):

1. Limit surface mining to no more than approximately 200 feet of overburden removal (NO_2, PM, SO_2, visibility).
2. Install fencing to restrict public access to active mining areas (1-hour NO_2).
3. Require blasting provisions for wind speed, direction, and variability, plus provisions for public notifications/alerts during blasting events (1-hour NO_2, PM).
4. Require diesel oxidation catalysts on heavy equipment (PM, HAPs, visibility, VOCs, CO).
5. Implement a dust control plan (PM).
6. Conduct continuous ambient air monitoring for PM_{10}, $PM_{2.5}$, NO_2, and visibility according to the adaptive management strategy.
7. Ensure that all controls used in the 200-foot overburden removal scenario demonstrate compliance with the NAAQS, including Tier 4 engines, dust control, etc. (PM, NO_2, SO_2).

The dust control plan described in design feature 5 would include at a minimum the following provisions:

- Appropriate watering and/or surfactant application
- Appropriate wind-fencing and/or other wind barriers to prevent windblown dust as needed
- Speed limits for vehicle traffic on-site
- Stabilization of stockpiles (overburden, coal, and/or topsoil) to prevent wind erosion
- Track-out provisions, including street-sweeping, grizzlies, and/or washing trucks before entering the roadway
- Covering and/or securing truck beds and other conveying devices to prevent fugitive dust emissions

Ambient air monitoring as required by design feature 6 would be used to demonstrate the effectiveness of these design features and validate the air modeling done for the DEIS and SDEIS analyses. Monitoring would be conducted according to the adaptive management strategy described below. If monitoring shows concentrations above the applicable NAAQS or indicates AQRV degradation, it would trigger the implementation of additional measures as defined in the adaptive management strategy to further decrease emissions.

Based on an agreement with the EPA, design features are established in lieu of modeling for 1-hour NO_2 and 1-hour $SO_{2.}$ The particular design features that apply to NO_2 and SO_2 are noted above. The use of ultra-low sulfur diesel fuel for nonroad vehicles and generators and the use of nonroad diesel engines and generators that meet Tier 4 emissions standards are also SO_2 design features.

4.3.1.1 ADAPTIVE MANAGEMENT STRATEGY

The leaseholder commits to developing a project-specific adaptive management strategy for air resources. This adaptive management strategy, as outlined here, has been designed to detect and address monitored air quality and AQRV degradation that can reasonably be attributed to emissions originating from mine activities on the tract. The adaptive management strategy would consist of the following three elements to be implemented in the order listed:

1. Conduct targeted air monitoring to address potential impacts to air quality or AQRVs in Bryce Canyon National Park and the town of Alton.
2. Based on monitoring, refine air quality analyses and/or modeling assessments as needed to determine whether any monitored air quality or AQRV deterioration is reasonably attributable to mine operations.
3. Implement additional environmental protection and mitigation measures as needed based on monitoring and source attribution.

The **first element** of this strategy, targeted project-specific air monitoring, would be funded and implemented by the leaseholder with oversight by the BLM (and in consultation with NPS) upon issuance of the lease, with monitoring operations beginning at least one year before mining activities start on the tract based on the timing of the permitting process. Air monitoring would consist of the following:

- The installation of equipment at a location near the south end of Bryce Canyon National Park and at an intermediate site between the tract and the park. The location of the in-park site would be designed to better address potential Bryce Canyon National Park impacts than the current, existing monitoring site. The intermediate site would address decreasing gradients in observed impacts between the tract and Bryce Canyon National Park, identifying potential issues and the need for additional evaluation.

- Use of a meter capable of continuous visibility measurements (coarse and fine particle scattering) (e.g., Optec nephelometer), an instrument capable of continuous absorption and scattering measurements from fine particulate mass (e.g., DTM PAX), and an instrument to record meteorological measurements such as wind direction, wind speed, and relative humidity at the in-park site.
- Use of a continuous visibility meter, as well as meteorological monitoring equipment, at the intermediate site.
- Solar power sources or other supplemental power options.
- The incorporation of existing equipment into the air monitoring, including the filter-based PM_{10} samplers at the Coal Hollow Mine. In addition, the existing Coal Hollow monitoring site between the Coal Hollow Mine and the town of Alton would be used to monitor and characterize possible NO_2 (and other) impacts to the residents of Alton.
- A four-year sampling period (to be extended if monitoring sites have recorded an exceedance of the NAAQS [not due to a natural event] or if impacts to Bryce Canyon National Park or the town of Alton have been clearly identified from mine operations)[4,5].
- The storage of data on-site with periodic offloading for transfer to a central facility for processing and database entry.
- Optical measurements related to visibility (dust, PM) collected on a shorter period than the 24-hour filter samples taken by the IMPROVE monitoring site.

Monitors would be operated to UDAQ specifications, and the monitoring data would be made publicly available. Existing NPS monitoring equipment, consisting of a night sky visibility camera and a daytime visibility camera, could also be incorporated into the adaptive management strategy. The process by which data are examined, processed, and transmitted to the appropriate parties (data tracking) would be fully defined in an interagency memorandum of understanding (MOU) to be developed after the ROD. The actual data tracking procedures may need to be adjusted or revised as monitoring information becomes available, but at a minimum should incorporate either annual or biannual periodic in-depth data assessments to evaluate overall trends and conditions, as well as data flagging. The adaptive management strategy would include a commitment to funding a third-party contractor to be responsible for the data analysis and tracking procedures, as defined by the BLM and NPS in consultation with the BLM Utah Air Resources Technical Advisory Group (ARTAG). The lessee would be responsible for funding the tracking component, in addition to the remaining elements of the adaptive management strategy.

If monitoring shows impacts to air quality and/or AQRVs at Bryce Canyon National Park or the town of Alton that can reasonably be attributed to emissions from mining operations, the BLM and NPS would review the data and develop an analysis plan to definitively determine the source(s) of the monitored impacts. The plan may include additional monitoring and/or modeling, emission inventory analysis, and/or other investigative techniques to be decided by the BLM and NPS in consultation with ARTAG. This is the second element of the strategy.

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[4] The primary concern for Bryce Canyon National Park is AQRV (visibility) impacts and the primary concern for the town of Alton is NAAQS exceedances.

[5] DOGM coal rules (R645-301-420 through R645-301-425) state that all surface coal mining and reclamation activities with projected production rates exceeding 1,000,000 tons of coal per year must have an air pollution control plan with "an air quality monitoring program to provide sufficient data to evaluate the effectiveness of the fugitive dust control practices" to comply with federal and Utah air quality standards. Therefore, monitoring will be required by DOGM for the tract anytime the production exceeds 1,000,000 tons per year (projected to be annually for the life of the mine). The four years of monitoring specified in the adaptive management strategy include elements not required by DOGM (e.g., NO_2) and would be timed to capture the maximum impact. The timing would be determined during the permitting process when the specifics of the mining activities are known.

To implement the **second element** of the strategy, quantifiable trigger points would be identified that define the potential for unacceptable impacts. This would include the identification of routine data analyses that indicate potential impacts from tract activities, such as wind roses and spatial gradients. Thresholds that account for the potential magnitudes, frequency, and duration of these impacts would also be defined. For monitoring sites in Bryce Canyon National Park, FLAG 2010 guidance (USFS et al. 2010) would be used to determine appropriate thresholds. Although desirable to define the analyses and trigger points ahead of time, it is likely that modifications to the protocols would be needed after data have been collected and analyzed. Refinements would be mutually agreed upon by all parties. The second element of the strategy would also identify the acceptable level of source attribution analysis if the defined thresholds are exceeded, while maintaining the ability to implement additional measures quickly if necessary. This could include analyses using air dispersion, back trajectory, and Eulerian chemical transport models integrated in a weight of evidence analysis. Additional monitoring might also be required to quantify source impacts.

If the refined air quality analysis conducted in response to the monitored air quality impacts shows the tract contributing to degraded air quality and/or AQRVs at Bryce Canyon National Park or the town of Alton (including any exceedances of the NAAQS), the mine operator would be required to adopt additional measures as soon as possible but within no more than one year of the determination depending on the required measure (the **third element** of the strategy). Additional measures may include the following actions:

- Provisions to reduce NO_2 from blasting related to the sizing of shots, quality of explosive materials, minimum elapsed time between blasts, and measures that could be employed to reduce the need for blasting altogether (1-hour NO_2)
- Heavy-duty vehicle controls, including NO_x combustion controls, limitation on the total number of vehicles in operation simultaneously, use of electrically driven equipment if available, and reduction of on-road emissions by obtaining lower-emitting engines than the county average (PM_{10}, $PM_{2.5}$, NO_x, HAPs)
- Dump height provisions, road paving (depending on the type of road in service), and/or fogging systems (PM_{10}, $PM_{2.5}$)
- Construction of buildings and/or silos to store coal, topsoil, and/or overburden (PM_{10}, $PM_{2.5}$)
- Restriction on simultaneously open pits as applicable (PM_{10}, $PM_{2.5}$)

Additional measures would be selected based on the nature of the monitored impacts, the effectiveness of the proposed measures to address monitored impacts, the feasibility of implementing the proposed measures, and final approval by the BLM in consultation with the NPS and ARTAG. The cost for these measures would be the sole responsibility of the successful bidder, and would be included as a design feature.

Because the exact mining sequence and particulars of the mining operation are unknown at this time (the leasing process), not all of the fine points of the adaptive management plan are delineated here. The successful lessee would submit detailed mining plans as part of the permitting process (which includes air quality permitting and related dispersion modeling) and additional details of the adaptive management strategy would be cooperatively determined at that time.

Potential mitigation measures are defined as additional means, measures, or practices *not* incorporated into the Proposed Action or alternatives as design features that would further reduce or eliminate impacts (see Section 2.6.1.9). Potential mitigation measures for air resources are described in Section 4.3.5 and would be considered as possible terms and conditions of the ROD (in the form of stipulations on the lease), if an action alternative is selected.

4.3.2 Emission Inventory

Air emissions are quantified to determine the relationship between emissions released into the atmosphere from various sources and the ambient concentrations that result. An emissions inventory is a listing, by source, of the amount of air pollutants discharged into the atmosphere per unit of time. Ambient concentration refers to the mass of a pollutant per unit volume in the atmosphere. It is commonly expressed in units of micrograms per cubic meter ($\mu g/m^3$). Tract-related air quality impacts can be predicted using the emissions calculated in an emissions inventory as inputs to a dispersion model. Dispersion model outputs are predicted concentrations of air pollutants in the atmosphere at receptors (locations where the dispersion model estimates pollution concentrations).

Adverse impacts to air quality generated by construction and mining activities in general would largely be due to the dispersion of small-diameter dust particles from the action of prevailing winds, the turbulence caused by moving machinery and trucks, or both. These dust emissions are typically called “fugitive dust” or PM. Other impacts include exhaust emissions from diesel engines (such as loaders and haul trucks) and from diesel-powered generators.

Initial construction activities for the tract would include development of an access road, site preparation for fixed (i.e., centralized) facilities (e.g., crushers, conveyors, generators, and office and maintenance buildings), development of the main haul road, delivery of materials and equipment to the mine, and other construction-vehicle activity. It is assumed that 36 acres would be disturbed for construction activities on the tract; approximately 6 acres would be disturbed each month for six months.

Pollutant emissions sources during mining activities (coal production) on the tract would include PM emissions and fuel-combustion emissions. Both surface and underground mining were considered in this analysis. Surface mining up to approximately 200 feet of overburden removal was considered for the Proposed Action, Alternative C, and Alternative K1. Emissions were calculated for 24 hours per day, seven days per week, and 52 weeks per year. The total number of operating days per year was assumed to be 365.

Emission estimates that would be associated with construction and mining activities and diesel-powered generators are provided in this section. Pollutants considered are $PM_{10,}$ $PM_{2.5}$, NO_x, VOCs, CO, SO_2, CO_2, and HAPs. On-site emission sources on the tract would include

- construction activities;
- topsoil removal and replacement;
- overburden removal and replacement;
- topsoil, overburden, haul truck, service vehicle, and employee travel on unpaved roads;
- wind erosion of disturbed areas and coal and overburden piles;
- coal loading, handling, and processing;
- bulldozer and grading activities;
- blasting, mobile source gaseous exhaust; and
- diesel-powered generators.

Off-site emission sources would include

- haul truck and employee travel on paved roads;
- motor vehicle exhaust;
- coal handling and train loading; and
- wind erosion of coal piles.

On-road motor vehicle emissions were calculated using 2005 Kane County mobile source (Mobile 6) emission factors from the UDAQ. A more recent mobile source emission estimation program, the Motor Vehicle Emission Simulation (MOVES), has been developed by the EPA to replace the Mobile model. However, UDAQ does not have MOVES model results for Kane County (UDAQ 2012). Based on a preliminary comparison of MOVES2010 to MOBILE6.2 by the EPA, the Mobile 6 modeling completed for the Alton Coal Tract air quality analysis may overestimate VOC emissions and underestimate NO_x and $PM_{2.5}$ (see Section 2.1.1 of the *Supplement to Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* in Appendix K).

4.3.2.1 ALTERNATIVE A: NO ACTION

Alternative A would result in no increases in air emissions associated with the tract. Emissions associated with growth or other developments would likely increase over time.

4.3.2.2 ALTERNATIVE B: PROPOSED ACTION

Construction and operation of the tract under the Proposed Action would result in both temporary and ongoing increases in emissions to the atmosphere. Two topsoil removal options exist for this alternative: 1) topsoil removal and replacement with scrapers, and 2) topsoil removal and replacement with a bulldozer, front-end loader, and trucks. A 200-foot overburden thickness removal scenario was evaluated. Following completion of surface mining, underground mining would occur for two or more years. Emissions are divided into five distinct groups: 1) emissions from construction; 2) on-site emissions with scrapers for topsoil removal and replacement; 3) on-site emissions with topsoil removal using a bulldozer, front-end loader, and trucks; 4) off-site emissions; and 5) emissions from underground mining. The construction phase would occur first, and the underground mining would occur last. Off-site emissions would occur for the two on-site options and during the underground mining phase. Estimated pollutant emissions from the five groups for the 200-foot overburden removal scenario under the Proposed Action are shown in Table 4.3.2.

Table 4.3.2. Estimated Pollutant Emissions (TPY), 200-foot Overburden Removal Scenario, Proposed Action

Pollutant	Construction	On-site Scrapers	On-site Front-end Loader/Trucks	Off-site	Underground Mining	Total
PM_{10}	13	154	146	1,079	99	1,491
$PM_{2.5}$	1.3	25.0	25.0	43.0	16.0	110.3
NO_x	–	223	229	171	73	696
VOCs	–	35	35	18	26	114
CO	–	354	352	186	249	1,141
SO_2	–	0.58	0.58	0.19	0.38	1.73
CO_2	–	35,307	36,822	18,423	40,561	131,113
Benzene	–	0.07	0.07	–	0.26	0.40
Toluene	–	0.03	0.03	–	0.09	0.15
Xylenes	–	0.02	0.02	–	0.06	0.10
Formaldehyde	–	0.01	0.01	–	0.03	0.05
Acetaldehyde	–	0.00	0.00	–	0.01	0.01
Acrolein	–	0.00	0.00	–	0.00	0.00

During underground mining, coal haul truck use and coal loading would be the same as during surface-mining operations. Generating capacity requirements would be greater for underground mining (an additional 3,000 kilowatts of power would be required). When underground mining begins, emissions would decrease for PM, NO_x, VOC, CO, and SO_2. CO_2 and HAP emissions would increase.

4.3.2.3 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

As under the Proposed Action, construction operations and mining of the tract under Alternative C would result in both temporary and ongoing emission increases to the atmosphere. Pollutant emissions as a result of topsoil removal options, the 200-foot overburden thickness removal scenario, and other components of mining the tract were evaluated for Alternative C in the same way as for the Proposed Action. Because there would be two open pits under Alternative C, fugitive dust emissions were doubled in the emissions inventory compared to the Proposed Action. This provided a better estimate of increased emissions resulting from the operational requirements of Alternative C (seasonal restrictions to address sage-grouse concerns). Estimated pollutant emissions from the five groups for the 200-foot overburden removal scenario under Alternative C are shown in Table 4.3.3.

Table 4.3.3. Estimated Pollutant Emissions (TPY), 200-foot Overburden Removal Scenario, Alternative C

Pollutant	Construction	On-site Scrapers	On-site Front-end Loader/Trucks	Off-site	Underground Mining	Total
PM_{10}	13	163	156	1,079	108	1,519
$PM_{2.5}$	1.3	27.0	26.0	43.0	18.0	115.3
NO_x	–	223	229	171	73	696
VOCs	–	35	35	18	26	114
CO	–	354	352	186	249	1,141
SO_2	–	0.58	0.58	0.19	0.38	1.73
CO_2	–	35,307	36,822	18,423	40,561	131,113
Benzene	–	0.07	0.07	–	0.26	0.40
Toluene	–	0.03	0.03	–	0.09	0.15
Xylenes	–	0.02	0.02	–	0.06	0.10
Formaldehyde	–	0.01	0.01	–	0.03	0.05
Acetaldehyde	–	0.00	0.00	–	0.01	0.01
Acrolein	–	0.00	0.00	–	0.00	0.00

HAP emissions (see the bottom 6 rows of Tables 4.3.2 and 4.3.3) from generators do not vary between alternatives because the same amount of combustion would occur under all alternatives. The difference in HAP emissions between alternatives for scrapers and front-end loaders/trucks is too small to register as a change in the emissions tables.

4.3.2.4 ALTERNATIVE K1: REDUCED TRACT ACREAGE

As under the Proposed Action, construction operations and mining of the tract under Alternative K1 would result in both temporary and ongoing emission increases to the atmosphere. Pollutant emissions as a result of topsoil removal options, the 200-foot overburden thickness removal scenario, and other components of mining the tract were evaluated for Alternative K1 in the same way as for the Proposed Action. Estimated pollutant emissions under Alternative K1 are identical to those under the Proposed Action (see Table 4.3.2).

4.3.3 Near-field Air Resources Impacts

The near-field analysis for the tract comprises a 50 × 50–km area with the tract in the center (the near-field dispersion model domain, see Map 3.5). The near-field analysis was conducted to assess impacts to public health and welfare and to estimate potential impacts to lakes and viewsheds in nearby (near-field) national parks.

In particular, the near-field, ambient, air resources impact assessment was performed to quantify maximum-modeled pollutant impacts near the tract. To demonstrate that air quality standards and AQRVs would be protected, the following are required: the development of short-term (hourly and daily) and long-term (annual) emission rates of regulated pollutants, application of regulatory-approved models to quantify predicted concentrations of regulated pollutants, and a comparison of predicted concentrations and relevant background concentrations with applicable standards.

The EPA’s guideline model, AERMOD, was the refined air dispersion model used to assess near-field impacts and to verify compliance with the applicable NAAQS in the ambient airshed that encloses the tract. The modeling analysis focused on the reasonable, maximum development year (i.e., the maximum emission year) for the mine. Using this anticipated, maximum, potential emission year, the AERMOD dispersion model was used to analyze potential near-field impacts of PM_{10}, $PM_{2.5}$, NO_2, CO, and SO_2.

The modeling results reported in the SDEIS are presented in a different form than those in the DEIS, per EPA request. Compliance with the respective NO_2 and SO_2 annual NAAQS was based on the highest modeled value (highest first-high [H1H]) for each year of the four-year meteorological dataset added to the respective background concentrations. Compliance with the respective short-term NAAQS (24-hour, 8-hour, 3-hour, and 1-hour) for CO and SO_2 was based on the highest second-high (H2H) modeled concentration for each year of the four-year meteorological period added to the respective background concentrations. Regulatory changes to the NAAQS NO_2 and SO_2 standards occurred during the DEIS tract analysis. Due to the timing of these regulatory changes in relation to the tract analysis, assessment of the new 1-hour NO_2 and SO_2 standards was not incorporated in the DEIS. However, specific design features for 1-hour NO_2 and SO_2 in lieu of modeling have been added to Section 4.3.1 of the SDEIS.

Compliance demonstrations with the 24-hour $PM_{2.5}$ standard used the 98th percentile 24-hour concentration (highest eighth-high [H8H]) for each year of the four-year meteorological dataset. Three-year H8H average concentrations were calculated for each alternative. Compliance with the annual $PM_{2.5}$ standard was based on the H1H concentration for each year of the four-year meteorological dataset; three-year annual average concentrations were calculated for each alternative. Compliance with the 24-hour PM_{10} standard was verified with the H2H modeled concentration for each year of the four-year meteorological dataset; three-year H2H averages were calculated for each alternative. Modeled concentrations for all criteria pollutants were rounded to match the form of the appropriate NAAQS.

For the SDEIS, a near-field ambient air quality impact assessment was performed for Alternative K1 to quantify maximum-modeled pollutant impacts near the tract at the boundary of the two blocks removed as part of Alternative K1, and within the two blocks that would be removed under Alternative K1. For the purposes of modeling, Alternative K1 is considered the same as the Proposed Action except that it has a modified boundary. This approach was used because the emissions would be the same under Alternative K1 and the Proposed Action. The receptors included in the Proposed Action and Alternative C modeling are presented in Figure 4.3.1. For the Alternative K1 analysis, only the receptors that are new (those within the area between the Proposed Action boundary and the Alternative K1 boundary) were included in the modeling. These receptors are shown in Figure 4.3.2.

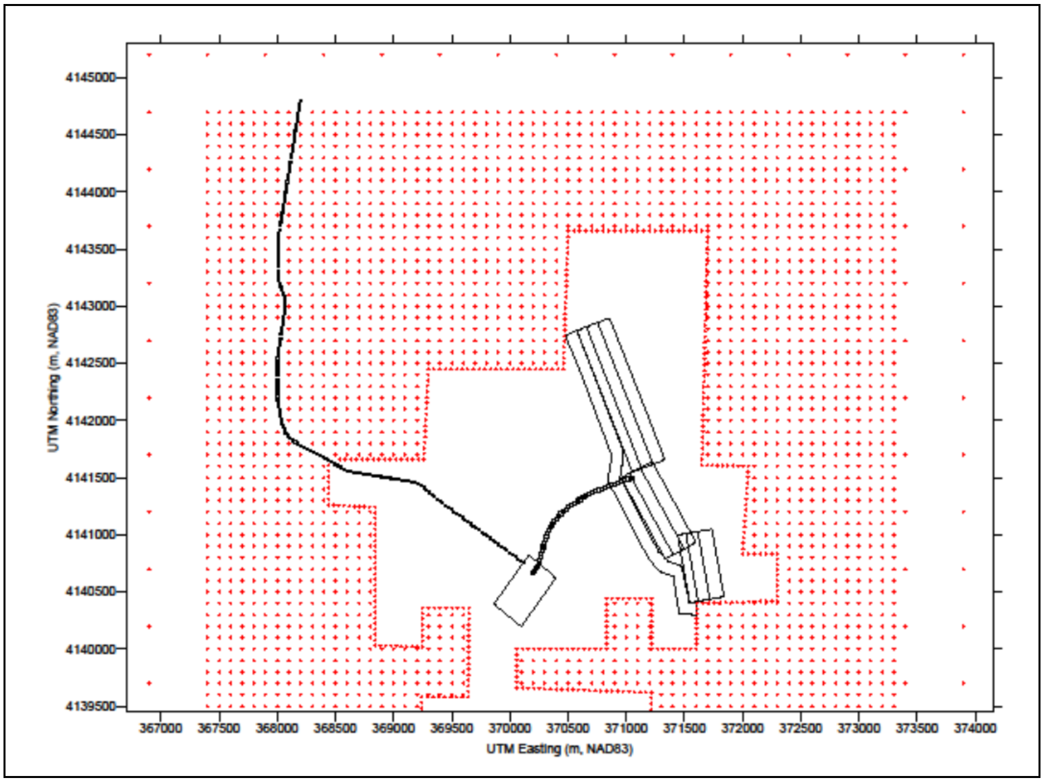

Figure 4.3.1. Proposed Action and Alternative C modeling receptors for the maximum development year (200-foot overburden) (see Appendix K).

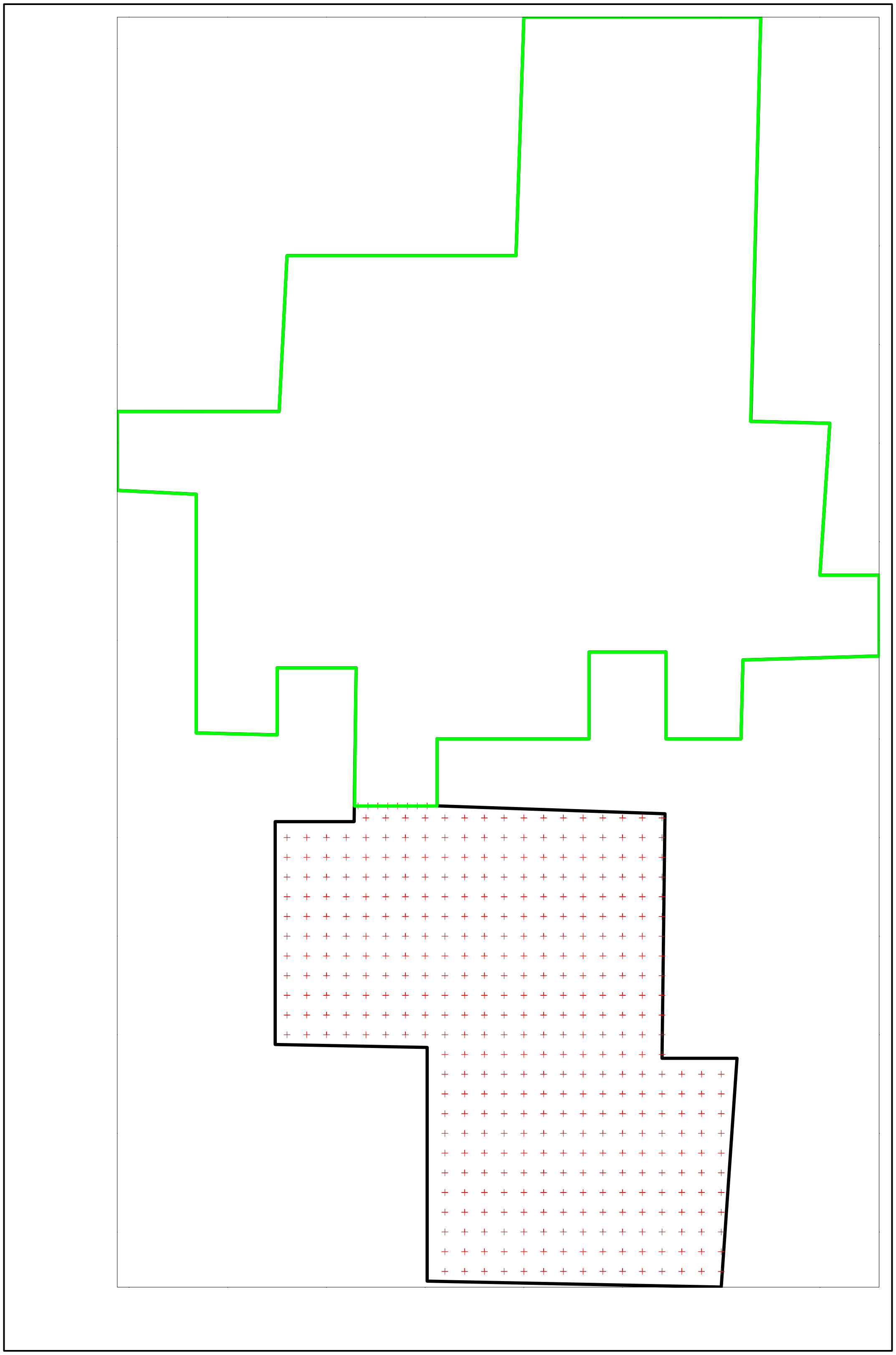

Figure 4.3.2. Alternative K1 modeling receptors (green line = effective new boundary; black line = previous boundary) (see Appendix K).

4.3.3.1 PM_{10} AERMOD RESULTS

Modeled PM_{10} concentrations associated with the maximum development year are summarized here. The 200-foot overburden removal scenario was modeled for compliance with the NAAQS under each action alternative. The 24-hour NAAQS is not to be exceeded more than once per year on average over three years. The H2H concentrations are presented in Table 4.3.4 for each year of the four-year meteorological period. The model results have been rounded to the form of the standard.

Table 4.3.4. PM_{10} Modeling Results (highest second-high)

Alternative	Model Year	Averaging Period	Modeled PM_{10} ($\mu g/m^3$)	Background PM_{10} ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)	Rounded PM_{10} ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Proposed Action	2005	24-hour H2H	77.6	72	149.6	150	150
	2006	24-hour H2H	84.5	72	156.5	**160**	150
	2007	24-hour H2H	80.2	72	152.2	150	150
	2008	24-hour H2H	85.7	72	157.7	**160**	150
	2005–2007	Average	80.8	72	152.8	150	150
	2006–2008	Average	83.5	72	155.5	**160**	150
	2005–2008	Average	82.0	72	154.0	150	150
Alternative C	2005	24-hour H2H	77.7	72	149.7	150	150
	2006	24-hour H2H	84.9	72	156.9	**160**	150
	2007	24-hour H2H	80.5	72	152.5	150	150
	2008	24-hour H2H	85.9	72	157.9	**160**	150
	2005–2007	Average	81.0	72	153.0	150	150
	2006–2008	Average	83.8	72	155.8	**160**	150
	2005–2008	Average	82.3	72	154.3	150	150
Alternative K1*	2005	24-hour H2H	33.8	72	105.8	110	150
	2006	24-hour H2H	42.4	72	114.4	110	150
	2007	24-hour H2H	41.2	72	113.2	110	150
	2008	24-hour H2H	37.2	72	109.2	110	150
	2005–2007	Average	39.1	72	111.1	110	150
	2006–2008	Average	40.3	72	112.3	110	150
	2005–2008	Average	38.7	72	110.7	110	150

* Additional receptors only.

Note: A number in bold is a modeled exceedance of the NAAQS.

The results for Alternative K1 (additional receptors) comply with the NAAQS at all modeled receptors. Results for the Proposed Action and Alternative C do not show modeled compliance with the NAAQS for the 2006–2008 averaging period. Results for the Proposed Action and Alternative C do show modeled compliance with the NAAQS for the 2005–2007 averaging period and over the four-year 2005–2008 meteorological dataset.

Compliance with the 24-hour PM_{10} standard can also be verified against the highest fifth-high (H5H) modeled concentrations over the four-year period. The H5H was originally recommended by UDAQ because only four years of meteorological data were available for modeling (rather than the H6H associated with five years of meteorological data). The form of the standard is not to be exceeded more than once per year on average over three years; therefore, the form allows one exceedance per year on average. With four years of meteorological data, the fifth exceedance would violate the NAAQS. Because the model results show that there is one exceedance on average per meteorological year, the H5H value does not exceed the standard.

Modeled exceedances are at the northwest side of the tract boundary near the boundary line. The public would only be exposed to lower concentrations of PM_{10}, because concentrations drop off quickly further away from the tract boundary.

Modeling is based on the maximum development year of a conceptual mine plan; a detailed mine plan would be developed during the permitting process from which actual air emissions would be modeled to obtain an air permit. As indicated above, a single exceedance does not necessarily indicate a violation of the standard because the standard states that the 24-hour PM_{10} should not be exceeded more than once per year on average over three years. In summary, modeling for the tract indicates that the potential exists for a short-term PM_{10} exceedance; however, the likelihood is low for a NAAQS violation based on the conservativeness of the modeling (see the following PM_{10} background value discussion) and the implementation of the adaptive management strategy.

Quarterly PM_{10} monitoring is ongoing at three monitors at or near the existing Coal Hollow Mine adjacent to the tract. The air monitoring program at the mine officially began in March 2011. Table 4.3.5 describes highest 24-hour mean PM_{10} results from quarterly monitoring reports beginning in the first quarter of 2011.

Table 4.3.5. Highest 24-hour Mean PM_{10} Concentrations Measured at Coal Hollow Mine

Monitoring Period	Measured PM_{10} Concentrations ($\mu g/m^3$)*			NAAQS ($\mu g/m^3$)
	Monitor 962A (background)	Monitor 963B (compliance)	Monitor 964C (co-located)	
1st Quarter, 2011	3.5	12.7	11.7	150
2nd Quarter, 2011	21.9	71.3	68.5	150
3rd Quarter, 2011	32.4	53.3	55.9	150
4th Quarter, 2011	n/a	n/a	n/a	150
1st Quarter, 2012	17.1	74.5	78.5	150
2nd Quarter, 2012	19.6	255.3†	233.7†	150
3rd Quarter, 2012	23.4	107.1	155.3	150
4th Quarter, 2012	12.1	66.3	104.6	150
1st Quarter, 2013	9.0	81.3	39.9	150
2nd Quarter, 2013	29.4	115.2	129.0	150

Source: UDEQ (2013), UDAQ (2012).

n/a = not available

* Measurements were collected during a 24-hour period and represent the average PM_{10} concentration during the midnight-to-midnight data-collection cycle. Only the highest 24-hour mean PM_{10} concentrations measured during each quarter are listed in the table. Monthly mean values are significantly lower.

† The monitoring report (ACD 2012) notes that NAAQS exceedances were because May and June had no measureable precipitation (as documented by an on-site meteorological station). Coal Hollow Mine brought in an additional water truck in early June and reapplied dust suppressant to the haulage and access roads to extend the capabilities of the water trucks in other areas of the mine for dust suppression. Additionally, the mine is installing an additional storage tank to store dust suppressant to be used as needed in problematic areas.

Background PM_{10} concentrations monitored near Coal Hollow Mine range from 3.5 to 32.4 µg/m^3, well below the background concentration of 72 µg/m^3 assumed for the PM_{10} modeling analysis (see Table 4.3.4). With the exception of four of the quarterly monitoring periods (2^{nd,} 3rd, and 4th Quarter, 2012 and 2nd Quarter, 2013 data), all monitored PM_{10} concentrations at Coal Hollow Mine are below the 2005–2008 average modeled result of 82.3 µg/m^3 for Alternative C, which is the maximum emission rate case. Compared to the Coal Hollow Mine data, PM_{10} results from the tract modeling analysis are conservative. If the maximum background concentration at Coal Hollow Mine (measured significantly lower than [less than half of] 72 µg/m^3) is added to the highest modeled PM_{10} emissions, no NAAQS exceedances would occur.

One of the design features that would be reflected in the lease stipulations for the tract would be the implementation of a dust control plan (see Section 4.3.1) to prevent elevated emissions in circumstances such as those that caused the PM_{10} exceedances at Coal Hollow Mine in the 2nd Quarter of 2012.

4.3.3.2 $PM_{2.5}$ AERMOD RESULTS

Modeled $PM_{2.5}$ concentrations associated with the maximum development year are summarized in Table 4.3.6. The 200-foot overburden removal scenario was modeled for compliance with the NAAQS under each action alternative. The form of the annual NAAQS is the annual mean, averaged over three years. The H1H for each year of the four years in the meteorological period is presented in the table. For comparison to the NAAQS, the three-year average of the H1H annual values was calculated for the years 2005–2007 and 2006–2008. These values are compared to the standard of 12.0 µg/m^3. The form of the 24-hour NAAQS is the 98th percentile concentration averaged over three years. The H8H modeled value represents the 98th percentile. The H8H 24-hour value for each of the four years in the meteorological period is presented in Table 4.3.6. For comparison to the NAAQS, the three-year average of the H8H annual values was calculated for the years 2005–2007 and 2006–2008. These values are compared to the standard of 35 µg/m^3. The model results have been rounded to the form of the standard.

Table 4.3.6. $PM_{2.5}$ Modeling Results

Alternative	Model Year	Averaging Period	Modeled $PM_{2.5}$ (µg/m^3)	Background $PM_{2.5}$† (µg/m^3)	Total $PM_{2.5}$ (µg/m^3)	NAAQS (µg/m^3)
Proposed Action	2005	24-hour	11.8	9.5	21	35
		Annual	4.2	2.8	7.0	12.0
	2006	24-hour	14.2	9.5	24	35
		Annual	4.4	2.8	7.2	12.0
	2007	24-hour	13.4	9.5	23	35
		Annual	4.7	2.8	8.0	12.0
	2008	24-hour	14.1	9.5	24	35
		Annual	4.2	2.8	7.2	12.0
	2005–2007 average	24-hour	13.1	9.5	23	35
		Annual	4.4	2.8	7.2	12.0
	2006–2008 average	24-hour	13.9	9.5	23	35
		Annual	4.4	2.8	7.2	12.0

Table 4.3.6. $PM_{2.5}$ Modeling Results

Alternative	Model Year	Averaging Period	Modeled $PM_{2.5}$ (μg/m^3)	Background $PM_{2.5}$† (μg/m^3)	Total $PM_{2.5}$ (μg/m^3)	NAAQS (μg/m^3)
Alternative C	2005	24-hour	12.9	9.5	22	35
		Annual	4.5	2.8	7.3	12.0
	2006	24-hour	15.5	9.5	25	35
		Annual	4.8	2.8	7.6	12.0
	2007	24-hour	14.5	9.5	24	35
		Annual	5.1	2.8	7.9	12.0
	2008	24-hour	15.4	9.5	25	35
		Annual	4.6	2.8	7.4	12.0
	2005–2007 average	24-hour	14.3	9.5	24	35
		Annual	4.8	2.8	7.6	12.0
	2006–2008 average	24-hour	15.1	9.5	25	35
		Annual	4.8	2.8	7.6	12.0
Alternative K1*	2005	24-hour	4.8	9.5	14	35
		Annual	1.2	2.8	4.0	12.0
	2006	24-hour	5.7	9.5	15	35
		Annual	1.5	2.8	4.3	12.0
	2007	24-hour	4.8	9.5	14	35
		Annual	1.5	2.8	4.3	12.0
	2008	24-hour	5.2	9.5	15	35
		Annual	1.8	2.8	4.6	12.0
	2005–2007 average	24-hour	5.1	9.5	15	35
		Annual	1.4	2.8	4.2	12.0
	2006–2008 average	24-hour	5.2	9.5	15	35
		Annual	1.6	2.8	4.4	12.0

* Additional receptors only.

† 2.8 μg/m^3 is the three-year (2006–2008) annual average $PM_{2.5}$ concentration for Bryce Canyon National Park; 9.5 μg/m^3 is the three-year average 98th percentile 24-hour value for Bryce Canyon National Park.

The 200-foot overburden removal scenario for all action alternatives complies with the NAAQS for modeled concentrations of $PM_{2.5}$ at all modeled receptors.

4.3.3.3 NITROGEN DIOXIDE AERMOD RESULTS

The maximum-modeled NO_2 annual concentrations associated with the maximum development year are summarized in Table 4.3.7 for each year of the four-year meteorological period. These values are compared to the standard of 100 μg/m^3. Based on the promulgation date for the 1-hour NO_2 standard (January 22, 2010), no 1-hour modeling was performed. However, in lieu of modeling, specific design features for 1-hour NO_2, including air monitoring and pollution controls, have been added to Section 4.3.1 of the SDEIS.

The 200-foot overburden removal scenario was modeled for compliance with the annual NAAQS. The estimated NO_2 emissions for the Proposed Action and Alternative C are the same. A 75% O_3 correction was applied to all modeled annual NO_2 modeling results. This correction was performed in accordance with EPA's Ambient Ratio Method of estimating ambient annual NO_2 concentrations from modeled NO_x emissions. The intent is to account for the interaction of ambient O_3 with emissions of NO_x, which can chemically interact to form NO_2. The model results have been rounded to the form of the standard.

Table 4.3.7. Annual Maximum Nitrogen Dioxide Modeling Results (highest first-high)

Alternative	Model Year	Modeled NO_2 (µg/m^3)	Background NO_2 (µg/m^3)	Total NO_2 (µg/m^3)	NAAQS (µg/m^3)
Proposed Action and Alternative C	2005	27.8	17	45	100
	2006	29.6	17	47	100
	2007	31.7	17	49	100
	2008	30.2	17	47	100
Alternative K1*	2005	9.1	17	26	100
	2006	11.3	17	28	100
	2007	11.8	17	29	100
	2008	13.5	17	31	100

* Additional receptors only.

Note: As a result of incorporating design features in lieu of modeling, this table does not include values for 1-hour NO_2.

The 200-foot overburden removal scenario under all action alternatives complies with the annual NAAQS for modeled concentrations of NO_2 at all modeled receptors.

4.3.3.4 CARBON MONOXIDE AERMOD RESULTS

The modeled CO concentrations associated with the maximum development year are summarized in Table 4.3.8 for each of the four years of the meteorological period. The 200-foot overburden removal scenario was modeled for compliance with the NAAQS. The 1-hour and 8-hour CO standards are not to be exceeded more than once per year. The results in Table 4.3.8 represent the H2H modeled concentration over the four-year meteorological period to meet the form of the standard. The estimated CO emissions for the Proposed Action and Alternative C are the same. Separate model runs were not necessary for the 200-foot overburden removal depth scenario. The model results have been rounded to the form of the standard.

Table 4.3.8. Carbon Monoxide Modeling Results (highest second-high)

Alternative	Model Year	Averaging Period	Modeled CO (µg/m^3)	Background CO (µg/m^3)	Total CO (µg/m^3)	NAAQS (µg/m^3)
Proposed Action and Alternative C	2005	1-hour	2,283	1,150	3,433	40,000
		8-hour	582	1,150	1,732	10,000
	2006	1-hour	2,567	1,150	3,717	40,000
		8-hour	485	1,150	1,635	10,000
	2007	1-hour	2,639	1,150	3,789	40,000
		8-hour	519	1,150	1,669	10,000
	2008	1-hour	2,416	1,150	3,566	40,000
		8-hour	486	1,150	1,636	10,000

Table 4.3.8. Carbon Monoxide Modeling Results (highest second-high)

Alternative	Model Year	Averaging Period	Modeled CO ($\mu g/m^3$)	Background CO ($\mu g/m^3$)	Total CO ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Alternative K1*	2005	1-hour	846	1,150	1,996	40,000
		8-hour	239	1,150	1,389	10,000
	2006	1-hour	1,009	1,150	2,159	40,000
		8-hour	224	1,150	1,374	10,000
	2007	1-hour	874	1,150	2,024	40,000
		8-hour	211	1,150	1,361	10,000
	2008	1-hour	934	1,150	2,084	40,000
		8-hour	245	1,150	1,395	10,000

* Additional receptors only.

The 200-foot overburden removal scenario under all action alternatives complies with the 1-hour and 8-hour NAAQS at all modeled receptors.

4.3.3.5 SULFUR DIOXIDE AERMOD RESULTS

Modeled SO_2 concentrations associated with the maximum development year are summarized in Table 4.3.9. The 3-hour and 24-hour SO_2 standards are not to be exceeded more than once per year. The results in Table 4.3.9 represent the H2H 3-hour and 24-hour modeled concentrations over each year of the four-year meteorological period. The annual modeled concentration is the H1H concentration over each year of the four-year meteorological period. The model results have been rounded to the form of the standard. Though potential SO_2 emissions associated with mining activities would be nominal, modeling was completed to quantify potential concentrations. Based on the recent promulgation date for the 1-hour SO_2 standard (June 2, 2010), no 1-hour modeling was performed. However, specific design features for 1-hour SO_2 in lieu of modeling have been added to Section 4.3.1 of the SDEIS.

Table 4.3.9. Sulfur Dioxide Modeling Results

Alternative	Model Year	Averaging Period	Modeled SO_2 ($\mu g/m^3$)	Background SO_2 ($\mu g/m^3$)	Total SO_2 ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Proposed Action and Alternative C	2005	3-hour	1.49	20	21	1,300
		24-hour†	0.35	10	10	365
		Annual†	0.09	5	5	80
	2006	3-hour	1.51	20	22	1,300
		24-hour†	0.41	10	10	365
		Annual†	0.09	5	5	80
	2007	3-hour	1.64	20	22	1,300
		24-hour†	0.41	10	10	365
		Annual†	0.10	5	5	80
	2008	3-hour	1.47	20	21	1,300
		24-hour†	0.47	10	10	365
		Annual†	0.09	5	5	80

Table 4.3.9. Sulfur Dioxide Modeling Results

Alternative	Model Year	Averaging Period	Modeled SO_2 (µg/m^3)	Background SO_2 (µg/m^3)	Total SO_2 (µg/m^3)	NAAQS (µg/m^3)
Alternative K1*	2005	3-hour	0.69	20	21	1,300
		24-hour†	0.17	10	10	365
		Annual†	0.03	5	5	80
	2006	3-hour	0.71	20	21	1,300
		24-hour†	0.17	10	10	365
		Annual†	0.03	5	5	80
	2007	3-hour	0.65	20	21	1,300
		24-hour†	0.16	10	10	365
		Annual†	0.03	5	5	80
	2008	3-hour	0.69	20	21	1,300
		24-hour†	0.17	10	10	365
		Annual†	0.04	5	5	80

* Additional receptors only.
† NAAQS revoked June 2, 2010.
Note: As a result of incorporating design features in lieu of modeling, this table does not include values for 1-hour SO_2.

The 200-foot overburden removal scenario under all action alternatives complies with the 3-hour, 24-hour, and annual NAAQS at all modeled receptors.

4.3.3.6 COAL HAUL ROAD IMPACTS

The reasonably foreseeable haul roads in the tract and the access road were included in the tract modeling. The entire reasonably foreseeable off-site coal haul road could not be incorporated into the model because of model limitations; however, impacts associated with the reasonably foreseeable off-site coal haul road were assessed using two methods:

- The long haul road was incorporated in the near-field modeling by attaching 39 volume sources depicting a segment of the long haul road starting from the intersection of the access road and the long haul road.
- A 1-km segment of the theoretical road, using emissions determined in the inventory, was modeled using receptors spaced at 25-m intervals out to 250 m from the edge of the road to assess potential impacts in areas far removed from the tract.

Additional detail regarding coal haul road modeling can be found in Appendix K. The modeled PM_{10}, $PM_{2.5}$, NO_2, and CO impacts associated with the coal haul road truck traffic do not contribute to off-site NAAQS compliance concerns. The apportioned modeled emission rates from each 50-m spaced volume source along the 1-km road are the same for all coal removal scenarios and are as follows:

- 0.00914 gram/second (g/s) PM10
- 0.000365 g/s PM2.5
- 0.001449 g/s NO2
- 0.001582 g/s CO

Table 4.3.10 lists the maximum-modeled concentrations for each pollutant and the applicable averaging period, all of which comply with the NAAQS.

Table 4.3.10. Off-site Coal Haul Road Only (representative segment) Maximum-Modeling Results

Pollutant	Modeled Years	Averaging Period	Modeled (μg/m^3)	Background (μg/m^3)	Total (μg/m^3)	NAAQS (μg/m^3)
PM_{10}	2005–2008	24-hour	55.1	72	127	150
$PM_{2.5}$	2005–2008	24-hour	1.8	9.5	11	35
		Annual	0.7	2.8	3.5	12.0
NO_2	2005–2008	Annual	3.2	17	20	100
CO	2005–2008	1-hour	53	1,150	1,203	40,000
		8-hour	17	1,150	1,167	10,000

Note: All maximum-modeled values occur when source receptors are at the same elevation.

4.3.3.7 HAZARDOUS AIR POLLUTANTS IMPACT ASSESSMENT

HAPs can cause various adverse health effects, as described in Section 3.3.2.1.1. They are not part of the NAAQS, but high levels at the tract boundary could indicate the need for further analysis, mitigation strategies, or both. Therefore, HAPs have been included in the emission inventory and were modeled in the AERMOD near-field analysis. The modeled concentrations were compared with known health exposure levels as a means of assessing potential impacts.

The only source of HAPs in the emissions inventory that can be quantified would be the generators needed to conduct mining operations. HAP emissions from the generators would be the same under all action alternatives because combustion would be the same. No adverse impacts from the tract HAP sources are anticipated based on the comparison between modeled concentrations and threshold health exposure levels (Tables 4.3.11 and 4.3.12).

Table 4.3.11. Hazardous Air Pollutants AERMOD Modeling Results (noncarcinogenic)

Pollutant	Model Years	Averaging Period	Receptor Location		Modeled (μg/m^3)	Threshold (μg/m^3)
			UTM East	UTM North		
Benzene	2005–2008	1-hour	371800	4140300	0.440	1,300 (REL)
		24-hour	368400	4142500	0.046	53 (TSL)
		Annual	370060	4140000	0.003	30 (RfC)
Toluene	2005–2008	1-hour	371800	4140300	0.160	37,000 (REL)
		24-hour	368400	4142500	0.017	2,512 (TSL)
		Annual	370060	4140000	0.001	5,000 (RfC)
Xylenes	2005–2008	1-hour	371800	4140300	0.110	22,000 (REL)
		24-hour	368400	4142500	0.011	14,473 (TSL)
		Annual	370060	4140000	0.001	100 (RfC)
Formaldehyde	2005–2008	1-hour	371800	4140300	0.045	37 (TSL)
		Annual	370060	4140000	0.0003	9.8 (RfC)

REL = recommended exposure limit; TSL = toxic screening level; RfC = reference concentration.

Table 4.3.12. Hazardous Air Pollutants AERMOD Modeling Results (carcinogenic)

Analysis	HAP Constituent	Carcinogenic Annual RfC (Risk Factor)* 1/(μg/m^3)	Exposure Adjustment Factor	Modeled (μg/m^3)	Calculated Risk	Significance Criterion
MLE	Benzene	7.80E-06	0.0949	0.003	2.2E-09	1.00E-06
MLE	Formaldehyde	5.50E-09	0.0949	0.0003	1.6E-13	1.00E-06
MEI	Benzene	7.80E-06	0.33	0.003	7.7E-09	1.00E-06
MEI	Formaldehyde	5.50E-09	0.33	0.0003	5.4E-13	1.00E-06

RfC = reference concentration; MLE = most likely exposure; MEI = maximally exposed individual.

* Data from EPA Air Toxics Database, Table 1 (EPA 2007).

HAP emissions from mobile sources and nonroad equipment were not quantified in the emission inventory due to the lack of appropriate emission factors. Mobile source emission factors obtained from the UDAQ do not include HAPs. The diesel-powered mining equipment emission factors obtained from the *Federal Register* (69:39219) also do not include HAP emission factors for these types of equipment or sources (EPA 2004). AP-42 and *Federal Register* PM emission factors (see “Table 7 of § 1039.102” in *Federal Register* 69:39219) from fugitive dust and combustion include diesel emissions; however, the emission factors do not speciate the constituents of the particular matter (e.g., diesel). Therefore, diesel, heavy metal impacts, or other specific components, cannot be separated out from the PM emissions. For the diesel-powered generators, emission factors for six of the current 187 listed HAPs are provided in Chapter 3.3 of the *Compilation of Air Pollutant Emission Factors* (EPA 1995). These six compounds are included in the emission inventory for the generators. However, these factors are not appropriate for mobile and nonroad sources.

Qualitatively, a comparison of diesel fuel usage for mobile and nonroad sources with that of the generators can be made to assess HAP impacts. Diesel fuel usage for the mobile and nonroad sources (i.e., area sources) is estimated to be 2,093,192 gallons; diesel fuel usage for the generators (i.e., point sources) is estimated to be 1,214,136 gallons. Total diesel fuel usage is approximately 1.7 times the generator fuel usage (see Appendix K). Modeled HAP impacts from the generators were more than two orders of magnitude below the risk thresholds and significance criterion (130 to 1,852,000). Because total diesel fuel usage is 1.7 times the usage for generators, it is unlikely that HAPs impacts would exceed any risk threshold or significance criterion.

4.3.3.8 NEAR-FIELD CLASS I AND CLASS II INCREMENTS

Under federal and state PSD regulations, increases in ambient air concentrations in Class I areas are limited by PSD Class I increments. Specifically, emissions associated with a particular development may increase ambient concentrations above baseline levels only within those specific increments developed for SO_2, PM_{10}, and NO_2. Modeling results for the maximum development year are presented in Table 4.3.13. For this air resources assessment, modeled concentrations are compared to the PSD increments. These comparisons are made for informational purposes only, and the analyses described herein are not intended to be, nor should they be, interpreted as a regulatory increment consumption analysis. This analysis was only performed for Alternative C because impacts from the other alternatives would be equal to or less than those presented here.

Table 4.3.13. Near-field Class I (Bryce Canyon National Park) and Class II (Grand Staircase-Escalante National Monument) Results for the Maximum Emission Rate Case (200-foot overburden removal, Alternative C)

Pollutant	Averaging Period	Class I Analysis Results		Class II Analysis Results	
		Cumulative Concentration (μg/m^3)	Class I Increment (μg/m^3)	Cumulative Concentration (μg/m^3)	Class II Increment (μg/m^3)
PM_{10}	Annual	0.01	4	0.33	17
	24-hour	0.25	8	2.34	30
SO_2	Annual	0.00	2	0.00	20
	24-hour	0.00	5	0.02	91
	3-hour	0.01	25	0.15	512
NO_x	Annual	0.04	2.5	1.73	25
$PM_{2.5}$	Annual	0.00	n/a	0.08	n/a
	24-hour	0.05	n/a	0.91	n/a
CO	8-hour	6.0	n/a	67	n/a
	1-hour	48	n/a	497	n/a

Because modeling results displayed in Table 4.3.13 show values far below the relevant increments, results are only presented for the maximum emission rate case (200-foot overburden removal, Alternative C); impacts from the other alternatives would be equal to or less than those presented here. Modeled concentrations are well below both the Class I and Class II increments. Even though there are no increments for $PM_{2.5}$ or CO, results are presented in Table 4.3.13 to convey a general impression of impact levels.

4.3.3.9 NEAR-FIELD VISCREEN ANALYSIS

VISCREEN was used to assess potential visibility impacts in the near-field modeling domain at Bryce Canyon National Park. The model indicates whether a plume from a source may be visible from a given vantage point. The primary pollutants of concern that may impact visibility in the near-field are PM (PM_{10} and $PM_{2.5}$), NO_x, and soot (EC). The conservative Level-2 VISCREEN visual impacts category was used to assess visibility impacts inside of Bryce Canyon National Park. The results are summarized in Table 4.3.14. This analysis was only performed for Alternative C because Alternative C represents the maximum emission rate case.

Only the sources associated with the surface-mining operation were modeled because the underground and surface mining operations would occur sequentially, rather than concurrently. Off-site sources are located too far from the mining operations for inclusion in this analysis.

Table 4.3.14. Visual Impacts Inside of Bryce Canyon National Park, 200-foot Overburden Removal Results for Alternative C

Background	Theta	Azimuth	Distance from Alton (km)	Alpha	Delta E		Contrast	
					Criteria	Plume	Criteria	Plume
Sky	10	157	35	11	5.35	0.420	0.13	0.009
Sky	140	157	35	11	3.70	0.108	0.13	-0.003
Terrain	10	84	18	84	5.44	1.205	0.28	0.005
Terrain	140	84	18	84	4.03	0.035	0.28	0.000

Note: Theta, azimuth, alpha, and delta E are VISCREEN modeling terms. *Theta* is the scattering angle or angle between direct solar radiation and the line of sight. *Azimuth* is an angular measurement in a spherical coordinate system, measured in degrees. *Alpha* is defined as the angle (in degrees) between a line of sight and the plume centerline. *Delta E* is the color difference parameter used to characterize the perceptibility of a plume on the basis of the color difference between the plume and a viewing background such as the sky or a cloud. *Contrast* is the relative difference in the intensity between the plume and its background (EPA 1992).

These results demonstrate that the maximum impacts inside of Bryce Canyon National Park from a potential tract plume under the Alternative C 200-foot overburden removal scenario would be less than the VISCREEN acceptance criteria for both color change (delta E) and contrast. Impacts from the Proposed Action and Alternative K1 would be equal to or less than those presented in Table 4.3.14.

4.3.4 Far-field Analysis

The purpose of the far-field analysis is to quantify potential air resources impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_x, CO, SO_2, PM_{10}, and $PM_{2.5}$ that are expected to result from mining operations on the tract. Ambient air quality impacts beyond the tract and throughout the modeling domain were analyzed, as were AQRVs at Class I areas and selected Class II areas.

The analyses were performed using the EPA-approved CALMET/CALPUFF/CALPOST modeling system to predict direct and indirect impacts to air resources at far-field PSD Class I areas and selected Class II areas. The term *CALPUFF* is generally used to represent the entire modeling system, including the pre- and post-processors.

Since the modeling analyses were completed for the DEIS, a revised FLAG guidance document has been released (USFS et al. 2010). The FLAG 2010 guidance was in draft form at the time the analysis was performed for the DEIS and was not used by the BLM because of the potential for it to be modified (the DEIS used FLAG 2000 guidance). Differences between FLAG 2000 and FLAG 2010 are presented in Table 4.3.15.

Table 4.3.15. Comparison of FLAG 2000 vs. FLAG 2010

Element	FLAG 2000	FLAG 2010	Implications for Alton Analysis
Annual emissions/distance (Q/D) screening criteria	None	≤ 10: sum of NO_x plus SO_2 emissions (TPY) divided by distance (km) from Class I area (page 18)	NO_x plus SO_2 emissions are less than 500 TPY. No visibility analyses required beyond 50 km.
Background visibility conditions	Based on annual average natural, using National Acid Deposition Program estimates	Based on annual average natural, or 20% best natural, using EPA data from Regional Haze Rule development (page xi)	New FLAG 2010 data are more refined than National Acid Deposition Program data.
Relative humidity adjustment factor f(RH)	Hour-by-hour (with RH capped at 98%)	Monthly average (with RH capped at 95%) (page x)	Using the FLAG 2010 monthly average with RH capped at 95% is less conservative.
First-level screening model	CALPUFF or CALPUFF-lite	< 50 km AERMOD, > 50 km CALPUFF (page xii)	AERMOD used < 50 km, CALPUFF used > 50.
Visibility assessment criteria	Maximum-modeled value	< 50 km calculate hourly estimates of changes in visibility, as characterized by the change in the color difference index (ΔE) and plume contrast (C) (page xiii), > 50 km calculate 98^{th} percentile modeled value at any receptor (page 23)	VISCREEN was used < 50 km, using the 98^{th} percentile eliminates the first seven highest concentrations at each receptor.
Deposition analysis thresholds/concern thresholds	None	Provided for nitrogen and sulfur deposition	Q/D screening criteria were not exceeded.
Adverse impact determination criteria	"Likely to Object" if 10% threshold exceeded; regulatory factors implicitly considered	Adverse impact determination process more explicit; considers regulatory and other factors	No visibility or deposition analysis is required based on Q/D.

Note: Data from this table are from Appendix K.

4.3.4.1 CLASS I AND CLASS II INCREMENTS

Under federal and state PSD regulations, increases in ambient air concentrations in Class I areas are limited by PSD Class I increments. Specifically, emissions associated with a particular development may increase ambient concentrations above baseline levels only within those specific increments developed for SO_2, PM_{10}, and NO_2. The modeling results for the maximum development year are presented in Table 4.3.16. For this air resources assessment, modeled concentrations are compared to the PSD increments. These comparisons are made for informational purposes only, and the analyses described herein are not intended to be, nor should they be, interpreted as a regulatory increment consumption analysis.

Table 4.3.16. Far-field Class I and Class II Results for the Maximum Emission Rate Case (200-foot overburden removal, Alternative C)

Pollutant	Averaging Period	Class I Analysis Results		Class II Analysis Results	
		Cumulative Concentration (µg/m^3)	Class I Increment (µg/m^3)	Cumulative Concentration (µg/m^3)	Class II Increment (µg/m^3)
PM_{10}	Annual	0.14	4	0.03	17
	24-hour	1.06	8	0.24	30
SO_2	Annual	0.00	2	0.00	20
	24-hour	0.02	5	0.01	91
	3-hour	0.06	25	0.07	512
NO_x	Annual	0.01	2.5	0.00	25
$PM_{2.5}$	Annual	0.01	n/a	0.00	n/a
	24-hour	0.04	n/a	0.02	n/a
CO	8-hour	25	n/a	52	n/a
	1-hour	108	n/a	118	n/a

Modeled concentrations are well below both the Class I and Class II increments. Even though there are no increments for $PM_{2.5}$ or CO, results are presented in Table 4.3.16 to convey a general impression of impact levels. Impacts from the Proposed Action and Alternative K1 would be equal to or less than those presented in Table 4.3.16.

4.3.4.2 VISIBILITY

Atmospheric light extinction relative to background conditions is used to measure regional haze. This analysis has been updated for the SDEIS and included the FLAG 2010 background visibility data (in response to comments). CALPOST was used to estimate change in light extinction from CALPUFF model concentration results.

The FLAG document provides guidance for evaluating visibility. A threshold change in light extinction of 5% or more (0.5 deciview) is considered to contribute to regional haze visibility impairment, and a threshold change of 10% or more (1.0 deciview) causes visibility impairment.

The far-field visibility results were updated to include EC effects from tract emissions and recomputation of the nitric acid/nitrate (HNO_3/NO_3) partition. To estimate the EC of the fine particulate, exhaust emissions were calculated for each stationary, mobile, and nonroad combustion source. On average, 26% of the calculated $PM_{2.5}$ emissions were estimated to be from combustion. It was assumed that 80% of the exhaust emissions were EC (NPS 2013d).

Visibility results for the Alton Coal Tract only are presented in Tables 4.3.17 and 4.3.18 for the Proposed Action and Tables 4.3.19 and 4.3.20 for Alternative C. Results summarize the CALPOST visibility calculation Method 6 and FLAG 2010 Method 8 processing. Visibility results for Alternative K1 would be equal to or less than those of the Proposed Action.

Table 4.3.17. Tract-only Visibility Impacts, Method 6, Proposed Action, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 6*	Proposed Action, 200-foot Overburden		
Class I/Class II Area	**No. of Days > 5%†**	**No. of Days > 10%†**	**Maximum Change (%)**
Capitol Reef National Park	0	0	1.3 (in 2002)
Grand Canyon National Park	0	0	3.0 (in 2001)
Zion National Park	3 (in 2002)	0	5.9 (in 2002)
Grand Staircase-Escalante National Monument	0	0	2.8 (in 2003)

* Method 2 results can be found in the *Supplement to Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* in Appendix K. Method 6 results are shown here because they indicate the overall highest impact. One individual maximum change % for Method 2 is slightly higher at Grand Staircase-Escalante National Monument.

† No. of days > 5% is approximately equivalent to a change of 0.5 deciview and no. of days > 10% is approximately equivalent to a change of 1.0 deciview.

Table 4.3.18. Tract-only Visibility Impacts, Method 8, Proposed Action, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 8	Proposed Action, 200-foot Overburden		
Class I/Class II Area	**2001 Change (%) 8^{th}-high**	**2002 Change (%) 8^{th}-high**	**2003 Change (%) 8^{th}-high**
Capitol Reef National Park	0.67	0.73	0.64
Grand Canyon National Park	0.93	1.04	0.95
Zion National Park	3.13	4.00	3.19
Grand Staircase-Escalante National Monument	1.30	1.50	1.40

Under the Proposed Action, Zion National Park has three extinction changes that exceed 5% for Method 6. There are no extinction changes that exceed 10% in any of the areas (maximum change of 5.9% at Zion National Park). The greatest percentage change for Method 8 is 4.0% at Zion National Park. Results for Alternative K1 would be equal to or less than those presented for the Proposed Action. The greatest percentage change for Method 8 is 4.0% at Zion National Park.

Table 4.3.19. Tract-only Visibility Impacts, Method 6, Alternative C, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 6*	**Alternative C, 200-foot Overburden**		
Class I/Class II Area	**No. of Days > 5%†**	**No. of Days > 10%†**	**Maximum Change (%)**
Capitol Reef National Park	0	0	1.3 (in 2002)
Grand Canyon National Park	0	0	3.1 (in 2001)
Zion National Park	3 (in 2002)	0	5.9 (in 2002)
Grand Staircase-Escalante National Monument	0	0	2.8 (in 2003)

* Method 2 results can be found in the *Supplement to Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* in Appendix K. Method 6 results are shown here because they indicate the overall highest impact. One individual maximum change % for Method 2 is slightly higher at Grand Staircase-Escalante National Monument.

† No. of days > 5% is approximately equivalent to a change of 0.5 deciview and no. of days > 10% is approximately equivalent to a change of 1.0 deciview.

Table 4.3.20. Tract-only Visibility Impacts, Method 8, Alternative C, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 8	**Alternative C, 200-foot Overburden**		
Class I/Class II Area	**2001 Change (%) 8^{th}-high**	**2002 Change (%) 8^{th}-high**	**2003 Change (%) 8^{th}-high**
Capitol Reef National Park	0.68	0.74	0.65
Grand Canyon National Park	0.94	1.05	0.96
Zion National Park	3.13	4.00	3.19
Grand Staircase-Escalante National Monument	1.32	1.53	1.43

Under Alternative C, Zion National Park has three extinction changes that exceed 5% for Method 6. There are no extinction changes exceeding 10% in any of the areas (maximum change of 5.9% at Zion National Park). The greatest percentage change for Method 8 is 4.0 % at Zion National Park.

FLAG 2000 guidance was used for the visibility analysis in the DEIS. Under FLAG 2010 guidance, no visibility analyses are required for receptors more than 50 km from the tract, because the sum of NO_x and SO_2 emissions for the tract is less than 500 TPY (i.e., 230 TPY). Bryce Canyon National Park is entirely within 50 km of the tract, and the visibility analysis for Bryce Canyon National Park used the VISCREEN model to evaluate color difference index (ΔE) and plume contrast (C). This analysis (see Section 4.3.3.9) is consistent with the FLAG 2010 guidance.

A portion of Zion National Park is within 50 km of the tract, and a portion of Zion National Park is outside 50 km. No visibility analyses are required for the portion outside 50 km (NO_x plus SO_2 emissions are less than 500 TPY). A VISCREEN-type analysis would be appropriate for the portion within 50 km. For illustrative purposes, the visibility results obtained using the FLAG 2000 guidance in the DEIS were compared to similar results calculated using the FLAG 2010 guidance.

EPA released a new version of CALPOST (V6.221 Level 080724) in 2008. The draft guidance that became FLAG 2010 is used in the Method 8 CALPOST algorithms to calculate visibility impacts. Model-predicted 2002 cumulative concentrations for the Proposed Action and the 200-foot overburden removal scenario were used with FLAG 2010 background visibility data for this analysis, along with CALPUFF-predicted concentrations. The highest visibility impact is selected for FLAG 2000, whereas the eighth-highest impact is selected for FLAG 2010. The comparison between the two methodologies is presented in Table 4.3.21.

Table 4.3.21. FLAG Guidance Documents: Visibility Impact Comparison

Class I Area, Guidance Document, Method	Change (%)
Zion National Park, FLAG 2000, Maximum	5.38
Zion National Park, FLAG 2010, 98^{th} percentile	3.94

Based on the comparison presented in Table 4.3.21, the percentage change predicted using the FLAG 2010 guidance (98^{th} percentile change, using the same CALPUFF concentrations) is lower than that predicted using the FLAG 2000 guidance (maximum change).

4.3.4.3 DEPOSITION

Maximum predicted sulfur and nitrogen deposition impacts were estimated for the 200-foot overburden removal scenario in the Proposed Action. Predicted, direct tract-related impacts were compared to the deposition analysis thresholds (DATs) for nitrogen and sulfur in western Class I parks and refuges.

The DATs were developed by the NPS and the USFWS to provide a quantitative method with which to evaluate deposition in Class I areas. A DAT is the additional amount of nitrogen or sulfur deposition within a Class I area (or within a federal land management area) below which estimated impacts from a proposed new or modified source are considered negligible. If a source's predicted contribution to deposition is less than the applicable DAT, the impacts are considered insignificant. If the impacts are equal to or greater than the DAT, the federal land manager would make a project-specific assessment of whether the projected increase in deposition would likely result in an "adverse impact" on resources considering existing AQRV conditions, the magnitude of the expected increase, and other factors (USFS et al. 2011).

Deposition analysis results are presented in Table 4.3.22. Nitrogen and sulfur emissions for the Proposed Action and Alternative C are identical; nitrogen and sulfur emissions for Alternative K1 would be equal to or less than those reported in Table 4.3.22.

Table 4.3.22. Maximum Predicted Nitrogen and Sulfur Deposition Results for the Proposed Action and Alternative C, 200-foot Overburden Removal

Location	Overburden Thickness (feet)	Alternative	Alton Coal Tract			
			Maximum Dry and Wet Annual Sulfur Deposition (kg/ha/year)	Sulfur DAT for Western Class I Parks and Refuges (kg/ha/year)	Maximum Dry and Wet Annual Nitrogen Deposition (kg/ha/year)	Nitrogen DAT for Western Class I Parks and Refuges (kg/ha/year)
Bryce Canyon National Park	200	Proposed Action, Alternative C	0.0001	0.005	0.0124	0.005
Capitol Reef National Park	200	Proposed Action, Alternative C	0.0000	0.005	0.0004	0.005
Grand Staircase-Escalante National Monument	200	Proposed Action, Alternative C	0.0000	0.005	0.0013	0.005
Grand Canyon National Park	200	Proposed Action, Alternative C	0.0000	0.005	0.0003	0.005
Zion National Park	200	Proposed Action, Alternative C	0.0000	0.005	0.0038	0.005
Navajo Lake	200	Alternative C	0.0000	0.005	0.0021	0.005

Impacts for sulfur deposition are below the DAT in all cases; impacts for nitrogen deposition are below the DAT in all cases except for Bryce Canyon National Park. The nitrogen deposition value for Bryce Canyon National Park exceeds the DAT.

Increased deposition may have a negative impact on AQRVs sensitive to nitrogen or sulfur deposition, including lakes, streams, soils, vegetation, and wildlife (USFS et al. 2011). Documented effects of nitrogen and sulfur deposition include acidification of lakes, streams, and soils; leaching of nutrients from soils; injury to high-elevation spruce forests; changes in terrestrial and aquatic species composition and abundance; changes in nutrient cycling; and unnatural fertilization of terrestrial ecosystems (USFS et al. 2010). Each ecosystem and its AQRVs respond somewhat differently to deposition (USFS et al. 2010). The modeled exceedance of the nitrogen deposition value indicates that the NPS would make a project-specific assessment as described earlier in this section.

4.3.4.4 ACID NEUTRALIZING CAPACITY

CALPUFF was used to predict annual deposition fluxes of sulfur and nitrogen at Navajo Lake for the maximum emission rate case (200-foot overburden removal scenario, Alternative C). Because no data on lake chemistry at Navajo Lake were available, no estimates of acid neutralizing capacity change in Navajo Lake were performed. However, maximum-modeled annual sulfur and nitrogen deposition values for Navajo Lake are 0.0000 and 0.0021 kg/ha per year, respectively. Both of these values are well below the DATs of 0.005 kg/ha per year for sulfur and nitrogen. Though acid neutralizing capacity change ultimately depends on the specific water body, Leydecker et al.'s (1999) study of high-altitude Sierra Nevada lakes found that even with depressed acid neutralizing capacity as a result of modeled snowmelt NO_3 and sulfate deposition rates up to 150% above baseline conditions, no lakes experienced chronic acidification.

4.3.4.5 GREENHOUSE GASES

The primary GHGs are CO_2, CH_4, N_2O, and fluorinated gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) (EPA 2013e). In 2011, United States GHG emissions were 84% CO_2, 9% CH_4, and 7% N_2O and fluorinated gases (EPA 2013e). The action alternatives would produce GHG emissions from the combustion of fuel by vehicles and equipment, and the release of CH_4 contained in the coal. The end user combustion of the coal (off-site) would also result in CO_2 emissions. This analysis focuses on CO_2 and CH_4 because together these gases account for most of the GHG emissions (93%).

Research on how emissions of GHGs influence global climate change and associated effects has focused on the overall impact of emissions from regional or global aggregate sources. This approach is required primarily because GHG emissions from single sources are small relative to aggregate emissions. The climate change research community has not yet developed tools specifically intended for evaluating or quantifying end-point impacts attributable to the emissions of GHGs from a single source. The current tools for simulating climate change generally focus on global- and regional-scale modeling. Global- and regional-scale models lack the capability to represent many important small-scale processes. As a result, confidence in regional- and subregional-scale projections is lower than at the global scale. Therefore, limited scientific capability exists to assess, detect, or measure the relationship between emissions of GHGs from a specific single source and any localized impacts.

Globally, approximately 31,780 million metric tons of CO_2 were added to the atmosphere through the combustion of fossil fuels in 2010 (EPA 2013c). The CO_2 emissions for the Proposed Action or Alternative C would be 58,984 tons (53,510 metric tons). This total includes all on-site emissions, as well as off-site emissions from employee travel, haul truck traffic, cars and light duty trucks, and heavy duty diesel vehicles. This represents approximately 0.0002% of the 2010 global emissions. CO_2 emissions from Alternative K1 would be equal to or less than those reported for the Proposed Action and Alternative C.

Annual coal production from the tract would be approximately 2 million tons. The annual worldwide primary coal production based on 2011 data is approximately 8.46 billion tons (EIA 2013). The coal produced from the tract would therefore be expected to account for approximately 0.024% of total worldwide annual production. Because heat content varies by coal produced, there is not a direct relationship to emissions produced. The percentage of emissions from burning the coal removed from the tract would be approximately the same magnitude as the production relationship. Because site-specific data are not available, EPA's default emission factor of 4,810 pounds per ton of subbituminous coal (EPA 1998) was used to approximate annual CO_2 emissions from combusting the 2 million tons of coal that would be produced from the tract. Based on this emission factor, the end user(s) of the coal produced from the tract would emit 4.8 million tons of CO_2 per year (4.4 million metric tons). This represents 0.014% of the total CO_2 emissions from 2010 global fossil fuel combustion. Annual estimated CO_2 emissions from mining operations on the tract (0.05 million metric tons) are small relative to the amount of estimated CO_2 emissions from end user annual combustion of the coal (4.4 million metric tons). The total of these two sources of annual CO_2 emissions (4.45 million metric tons) is approximately 0.014% of 2010 global emissions from fossil fuel combustion (see Table 4.3.23).

Globally, approximately 588.6 million metric tons of carbon dioxide equivalent (CO_2e) are emitted annually from coal mining (EPA 2012h). Based on an estimate of 0.1 cubic cm per gram (cm^3/g) of CH_4 in the Smirl Coal Zone in the Alton Coal Field (Duel et al. 1988), estimated annual CO_2e emissions from the tract are 5,653,546 tons or 5,128,870 metric tons (assuming 100% of the CH_4 in the coal is released). This value represents approximately 0.87% of global emissions from coal mining.

Table 4.3.23. Carbon Dioxide Emission Comparisons

Comparison	Global	Alton Coal Tract (mining operations)	End User Annual Combustion of Coal Produced from the Tract	Total Emissions related to Alton Coal Tract
CO_2 emissions from fossil fuel combustion, MMTPY	31,780	0.05 (0.0002% of global emissions)	4.4 (0.014% of global emissions)	4.45 (0.014% of global emissions)
CO_2e emissions from coal mining, MMTPY	588.6	5.13 (0.87% of global emissions)	n/a	5.13 (0.87% of global emissions)
Annual coal production, million tons	8,460	2 (0.024% of global production)	n/a	n/a

4.3.5 Potential Mitigation Measures

Section 4.3.1 describes the design features for the Alton Coal Tract. The design features are environmental protection measures, actions, or practices that are part of the Proposed Action and all action alternatives and would be implemented by the lessee. Potential mitigation measures are additional means, measures, or practices *not* incorporated into the Proposed Action or alternatives as design features that would further reduce or eliminate impacts. These air resources mitigation measures would be considered as possible terms and conditions of the ROD (in the form of stipulations on the lease), if an action alternative is selected.

If the BLM’s decision is to offer the tract for competitive leasing under any one of the action alternatives, the successful lessee would be required to obtain an air permit from the UDAQ. This air permit (and other permits that would be required prior to conducting mining operations on the tract) would be based on detailed mine plans (as described in Chapter 2, the analyses in this EIS are based on conceptual mine plans using conservative estimates and assumptions).

The following mitigation measures could be applied to reduce GHG emissions, as appropriate and economically feasible:

- Reduce engine idling or implement a “no idling” policy during construction and mining operations.
- Use biodiesel fuel in construction equipment and vehicles (typically blends of biodiesel and petroleum fuels can be used in diesel engines without any need for engine modifications).
- Use biodiesel fuel in operations equipment and vehicles.

4.3.6 Unavoidable Adverse Impacts

Unavoidable adverse impacts to air resources from mining and transporting coal under any of the three action alternatives would consist of increases in concentrations of criteria pollutants and HAPs. As a consequence of increased concentrations of criteria pollutants, some decrease in AQRVs would occur but would be within threshold values based on current regulations and guidance, with the exception of the nitrogen deposition value for Bryce Canyon National Park, which exceeds the DAT. Though pollutant concentrations would increase under the alternatives modeled, values show compliance with all the NAAQS, except for the 2006–2008 averaging period for the PM_{10} 24-hour standard under the Proposed Action and Alternative C 200-foot overburden removal scenario.

Multiple design features (control measures) have been incorporated into the analysis. Potential mitigation measures identified in Section 4.3.5 would further reduce GHG emissions and associated impacts. The adaptive management strategy would detect and address monitored air quality and AQRV degradation caused by mining activities on the tract, and would implement additional environmental protection and mitigation measures as needed.

4.3.7 Short-term Uses versus Long-term Productivity

The short-term use of the tract for mining operations would result in impacts to air resources in the analysis area for the duration of the mining operations. However, upon mine closure and reclamation, these impacts would be eliminated and would therefore not impact the long-term productivity of the air resource.

4.3.8 Irreversible and Irretrievable Commitments of Resource

The irreversible commitment of a resource means that, once committed, the resource is permanently lost to other uses. This type of commitment generally applies to nonrenewable resources (e.g., minerals, geologic features, or cultural resources) or to resources that are only renewable over a very long period of time (e.g., soil productivity or perhaps old-growth forest). Irretrievable commitments of resources, on the other hand, are regained following cessation of the activity and reclamation. There would be no irreversible commitments of air resources from mining the tract. All air resource impacts described would be irretrievable because air quality would cease to be impacted by mining operations following cessation of mining activities.

4.4 Cultural Resources

Inventories to identify and evaluate cultural resources in the Alton Coal Tract were conducted by Montgomery Archaeological Consultants, Inc. on behalf of ACD (Stavish 2007, 2008b) and by the BLM (Zweifel 2007). These inventories resulted in the identification of 132 prehistoric, historic, and multicomponent sites (a multicomponent site is one that contains both prehistoric and historic archaeological materials). Of these 132 sites, 107 are eligible for the NRHP (Table 4.4.1).

Table 4.4.1. Summary of Archaeological Site Types in the Tract

Cultural Association	Eligible	Not Eligible	Total
Historic	0	6	6
Multicomponent	7	0	7
Prehistoric	100	19	119
Total	**107**	**25**	**132**

In addition to these archaeological sites, other cultural resources that may be affected by the Proposed Action and alternatives include the Panguitch Historic District, which is listed on the NRHP, and Utah Heritage Highway 89 with its associated Mormon Pioneer Heritage Area. Finally, the Proposed Action and alternatives may affect TCPs identified by Native American groups during consultation with the BLM.

Impacts to these cultural resources under the Proposed Action and alternatives are analyzed here. Impacts for the Proposed Action, Alternative C, and Alternative K1 are considered by type of disturbance: surface mining, underground mining, construction of centralized facilities, KFO Route 116 relocation, short haul route, construction of dispersed facilities, increased human presence, other indirect effects, and coal truck traffic. It should be noted that not all 132 sites would be disturbed by each of the individual mining activities. Therefore, the following impact sections disclose the number of sites impacted by each activity. Methods and assumptions for the analysis are described next.

4.4.1 Regulatory Framework

According to the KFO RMP, the identification, preservation, and protection of significant cultural resources are necessary to ensure their appropriate uses for future generations (BLM 2008b). FLPMA Sections 1039I, 201(a), and (c); the National Historic Preservation Act (NHPA) Sections 106 and 110(a); and Archaeological Resources Protection Act Section 14(a) provide the regulatory framework that ensures cultural resource protection.

Prior to any mining disturbance, consultation with the SHPO would occur to evaluate the NRHP eligibility of cultural properties and to evaluate the effects of mining on historic properties as stipulated in the PA developed for the tract. Cultural properties determined eligible for the NRHP would be avoided; if avoidance is not be possible, a data recovery plan would be implemented prior to disturbance also as stipulated in the tract's PA.

Design features with regard to cultural resources include the following:

- Conducting Class I and III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings
- Consulting with the SHPO to evaluate eligibility of cultural properties for the NRHP
- Consulting with the SHPO to evaluate effects of mining on historic properties

- Avoiding or recovering data from significant cultural properties identified by surveys, according to the approved cultural resources mitigation plan
- Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations
- Instructing employees on the importance of cultural resources and the regulatory obligations to protect those resources
- Consulting with Native American tribes that have known interests in this area of leasing action and requesting assistance with identification of potentially significant religious or cultural sites
- Avoiding or recovering data from significant cultural properties identified by surveys, according to the approved HPTP
- Complying with the Native American Graves Protection and Repatriation Act

4.4.1.1 CULTURAL RESOURCES PROGRAMMATIC AGREEMENT

In December 2011, BLM initiated a formal consultation process with relevant federal agencies, Indian tribes, Utah's SHPO, representatives of local governments, interested members of the public, and the applicant to develop a PA in accordance with the NHPA Section 106 implementing regulations (36 CFR 800.14). The PA specifies how BLM will consider the effects of the undertaking on historic properties and includes detailed discussions of the APE, measures to identify and mitigate adverse effects to historic properties, and mechanisms for maintaining involvement of Indian tribes and the interested public. The PA is currently being circulated for signatures, and the text of the agreement is included in its entirety as Appendix M. Key stipulations of the PA include the following:

- Ongoing consultation with Indian tribes regarding historic properties of religious and cultural significance
- Defining the APE for the purposes of NHPA Section 106 consultation to include the entire lease area and a buffer extending 1 mile from the external boundaries of the lease area; the reasonably foreseeable haul route along US-89, SR-20, I-15, and a buffer extending 500 feet on each side of the reasonably foreseeable haul route highway centerlines; the Panguitch Historic District; the town of Alton, Utah; and the town of Hatch, Utah
- Requiring a Class I cultural resources inventory that summarizes known cultural resources inside the APE
- Requiring a Class III cultural resources inventory in all portions of the APE where activities would result in new ground disturbance
- Requiring a reconnaissance-level survey to document and evaluate historic buildings in all portions of the APE that have not been subject to survey for historic buildings within ten years prior to the execution of the PA
- Specifying the reporting requirements of Class I, Class III, and reconnaissance-level survey surveys
- Requiring that an HPTP that addresses adverse effects to NRHP-listed or eligible historic properties be developed and implemented before mining activities start
- Requiring that a Native American Graves Protection and Repatriation Act plan of action be developed and included as part of the HPTP
- Requiring that cultural resources monitoring and inadvertent discoveries plans be developed and included as part of the HPTP
- Requiring BLM and OSM to invite tribes and consulting parties to a meeting to review the implementation of the PA every five years throughout the life of the project

4.4.2 Impact Indicators and Thresholds

Impacts to cultural resources are analyzed by evaluating the extent to which NRHP-eligible properties would be affected directly or indirectly by any of the actions included in each alternative. The criteria used to assess adverse effects to NRHP-eligible properties are set forth in 36 CFR 800.5. An adverse effect consists of any impact that may alter one or more of the characteristics of a historic property that make the property eligible for the NRHP. Characteristics that must be considered with regard to NRHP criteria include the integrity of the property's setting, feeling, location, design, materials, workmanship, and association. In addition, consideration must also be given to effects that may alter the property's eligibility under any of the four NRHP Criteria (A to D). Criterion A refers to a property's association with events that have made a significant contribution to the broad patterns of our history. Criterion B refers to a property's association with the lives of persons significant in our past. Criterion C refers to properties that embody the distinctive characteristic of type, period, or method of construction, or that represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction. Criterion D refers to properties that have yielded or may be likely to yield information important in prehistory or history. Most of the 132 sites that would likely be adversely affected under either action alternative are eligible under Criterion D.

Direct effects consist of any physical destruction or damage to all or part of the property, such as the creation of roads or trails through the resource, the selling or leasing of the land where the resource is located, development that would alter the physical landscape of the resource, and any other types of human activity that could affect the physical integrity of the landscape where the resource is located. Direct effects may also result from activities in areas adjacent to the resource, such as when the creation of a road, trail, or recreational facility denudes vegetation in the area or changes water drainage patterns and causes erosion of the resource.

Some of the more substantial indirect effects on cultural resources typically result from increased human activity in the area, which can increase the risk of vandalism, looting, or unintentional destruction of a property. Prehistoric sites are especially vulnerable to these effects. Other types of indirect effects can impact a property's integrity of setting, feeling, or association, rather than its physical integrity. These characteristics can be affected by visual intrusions such as buildings and transmission lines, by alteration of the surrounding landscape, or by atmospheric intrusions such as dust clouds or smog. They can also be affected by substantial changes to the audible environment; such changes can result from increased vehicle or air traffic, the operation of heavy machinery, blasting, or elimination of the natural sounds that would have created the historical audible environment.

Finally, cumulative impacts are those that occur when the effects of an action are added to or interact with the effects of other past, present, and RFFAs, regardless of who is responsible for such actions. Cumulative impacts may result from individually minor, but collectively significant actions occurring over a period of time. For example, if cultural resources are being affected by development in areas adjacent to or nearby an area that is the subject of an action, then that action may contribute to a larger pattern of impacts in the region. Sites of specific types or from specific time periods may not have great individual significance, but if several such sites are being impacted by a variety of developments, they may become a rare and a much more valuable resource.

In this general framework, the effects of the Proposed Action and the alternatives on cultural resources are analyzed by considering these specific impact indicators:

- For archaeological sites and/or TCPs located in the tract, the number of sites completely or partially physically destroyed (e.g., by surface-mining activities or construction of facilities)
- For archaeological sites and/or TCPs located in the tract that are not physically destroyed, the loss of integrity, as defined above due to other direct and indirect effects

- For the Panguitch Historic District, Utah Heritage Highway 89 and the associated Mormon Pioneer Heritage Area, and Native American sacred sites or other TCPs not located in the tract, the loss of integrity of setting, feeling, and association

The first of these indicators can be analyzed quantitatively using data on cultural resource sites identified in the tract. The remaining two, which involve loss of integrity, must be analyzed qualitatively.

4.4.3 Analysis Assumptions

This analysis assumes that impacts to sites in areas of surface disturbance would be mitigated following procedures outlined in a HPTP created especially for the tract as stipulated in the PA. It also assumes that impacts to sites that have not yet been identified but that may be encountered during the course of mining or construction activities (e.g., deeply buried sites without surface manifestations that allowed them to be identified during inventory) would be mitigated through monitoring procedures similar to those described in the data recovery plan. The PA developed for the tract stipulates that a cultural resources monitoring plan and discovery plan will be included in the HPTP (see Appendix M).

4.4.4 Alternative A: No Action

Under the No Action Alternative, ACD's application to lease the coal included in the tract under the Proposed Action or Alternative C would not be approved, the tract would not be offered for competitive lease sale, and the coal included in the tract would not be mined. As such, no coal mining activities or infrastructure development would occur under the No Action Alternative, and therefore no archaeological sites or other cultural resources would be directly affected by these activities. Likewise, no cultural resources located either inside or outside of the tract would be indirectly affected by increased vandalism, looting, or unintentional damage resulting from increased access associated with mining activities from the action alternatives, nor would the integrity of setting, feeling, or association of such resources be affected. Under the No Action Alternative, current land uses such as recreation, livestock grazing, and vegetation treatments may impact archaeological sites or cultural resources in the tract.

Management of cultural resources on BLM-administered lands in the tract would continue at the discretion of the BLM under the KFO RMP. The objectives of the RMP with regard to cultural resources are 1) to identify, preserve, and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations, 2) to seek to reduce imminent threats and resolve potential conflicts by ensuring that all authorizations for land use and resource use comply with NHPA Section 106, 3) to provide opportunities for scientific and educational uses of cultural resources, 4) to provide opportunities for traditional (Native American) uses of cultural resources, and 5) to ensure compliance with the Native American Graves Protection and Repatriation Act (BLM 2008b).

4.4.5 Alternative B: Proposed Action

Under the Proposed Action, the tract would be offered for lease at a sealed-bid, competitive lease sale, subject to lease stipulations for the tract. The boundaries of the tract under the Proposed Action (see Map 1.2) would be reasonably consistent with the tract reconfiguration completed by the BLM after ACD's original LBA submittal (see Map 2.7). Approximately 1,993 acres of surface disturbance (surface mining and infrastructure development) would occur in the tract under the Proposed Action. In addition, underground mining would occur on 717 acres of land in the tract.

4.4.5.1 EFFECTS OF SURFACE-MINING ACTIVITIES ON CULTURAL RESOURCES

Of the 1,993 acres of surface disturbance that would occur in the tract under the Proposed Action, 1,750 acres would be the direct result of surface mining (pit disturbance) (see Map 1.2). There are 92 known archaeological sites located either partially or wholly in the areas that would be surface mined; of these, 75 are eligible for the NRHP. These sites, or portions of them, would be destroyed by the surface-mining process. As described in the PA, these sites would undergo archaeological testing and, if warranted, data recovery (i.e., excavation as well as other methods of collecting data) before being disturbed by surface mining. Thus, the loss of archaeological sites to surface mining would be offset to some degree by the acquisition of new information about the area's history and prehistory.

It is also possible that an unknown number of previously unidentified sites would be encountered during surface mining and may thus be affected. Implementation of a monitoring plan would mitigate impacts to NRHP-eligible sites and allow for the possibility of conducting data recovery at them.

4.4.5.2 EFFECTS OF UNDERGROUND MINING ACTIVITIES ON CULTURAL RESOURCES

Under the Proposed Action, underground mining would result in subsidence on 613 surface acres of the tract. An additional 166 surface acres outside the tract boundary but within the angle of influence would be disturbed by subsidence due to underground mining (see the Geology and Minerals section for more information on subsidence and angle of influence). Under the 200-foot overburden removal scenario, four sites occur within the 613 surface acres susceptible to subsidence from underground mining activity. One site is eligible for the NRHP.

The specific method of underground mining that would be used is not yet known, but regardless of the method, any surface disturbance associated with underground mining would occur in the pit disturbance areas discussed in the previous section (e.g., accessing subsurface coal from a high wall exposed in a pit). Thus, compared to archaeological sites located in surface-mining areas, the impacts to sites located on the surface in the underground mining area would be relatively low. The main effect that underground mining may have on archaeological sites would occur through subsidence. Until a detailed mining plan is developed, the extent of subsidence that would occur cannot be estimated. However, the integrity of sites could possibly be diminished as a result. In particular, subsidence could alter spatial and stratigraphic relationships among artifacts and other materials, reducing their potential to provide archaeologically important information. Subsidence might also cause architectural damage to prehistoric or historic structures, although it is unlikely that such structures exist in the underground mining area because no archaeological sites were identified in this area, and sites with structures are generally the most visible type of archaeological site.

4.4.5.3 EFFECTS OF CENTRALIZED FACILITY CONSTRUCTION ON CULTURAL RESOURCES

Under the Proposed Action, centralized facilities associated with mining activities in the tract would be located on approximately 36 acres of BLM-administered land in the tract's no-coal zone (areas outside of pit disturbance boundaries) (see Map 1.2). There are four archaeological sites located either partially or wholly in the centralized facility area; all four of these sites are eligible for the NRHP.

These sites would likely be destroyed by facilities construction. These sites would undergo archaeological testing and, if warranted, data recovery before construction begins. Thus, as with archaeological sites lost to surface mining, the loss of these sites would be offset to some degree by the acquisition of new information about the area's history and prehistory.

In the surface-mining areas, it is possible that some unknown number of previously unidentified sites would be encountered during construction of centralized facilities. Implementation of a monitoring plan would mitigate impacts to NRHP-eligible sites discovered in this way and would allow for the possibility of conducting data recovery.

4.4.5.4 EFFECTS OF KANAB FIELD OFFICE ROUTE 116 RELOCATION ON CULTURAL RESOURCES

Based on a series of assumptions discussed in Section 4.1.3, relocation of KFO Route 116 under the Proposed Action would affect as many as four archaeological sites, two of which are eligible for the NRHP. These sites are located within potential ROWs for the relocated road and would be partially or completely destroyed by road construction. However, it might be possible to mitigate impacts to these sites during final road design by locating the road and associated construction areas to avoid them. If avoidance is not possible, these sites would undergo archaeological testing and, if warranted, data recovery before road construction begins, and their loss would be offset to some degree by the acquisition of new information about the area's history and prehistory.

4.4.5.5 EFFECTS OF DISPERSED FACILITY CONSTRUCTION ON CULTURAL RESOURCES

Dispersed facilities would be constructed under the Proposed Action on an estimated 160 acres; these 160 acres would be located within the 1,183 acres of the tract's no-coal zone outside of the 36-acre centralized facility area. There are 45 archaeological sites located either partially or wholly in the area available for dispersed facility construction, 35 of which are eligible for the NRHP. It is unlikely that it would be possible to avoid all archaeological sites in the construction of dispersed facilities, but because the locations of dispersed facilities are not yet known, it is not possible to determine the exact number of sites that would be impacted by them. However, it can be assumed that impacts to archaeological sites from dispersed facilities would be proportionate to the percentage of the area available for dispersed facilities that would actually be occupied by them (13.5%). Applying this percentage to the number of known archaeological sites in the area available for dispersed facilities, it is likely that approximately six archaeological sites would be impacted by dispersed facilities, and that approximately five of these would be eligible for the NRHP.

As with sites located in the surface-mining and centralized facilities areas, those impacted by construction of dispersed facilities would likely be partially or completely destroyed. However, these sites would undergo archaeological testing and, if warranted, data recovery before construction begins, and the loss of these sites would be offset to some degree by the acquisition of new information about the area's history and prehistory.

In addition, it is possible that some unknown number of previously unidentified sites would be encountered during construction of dispersed facilities, and may thus be affected. Implementation of a monitoring plan would minimize or mitigate impacts to NRHP-eligible sites discovered during construction by allowing facilities to be moved to avoid them, or by allowing for the possibility of conducting data recovery at them.

4.4.5.6 INDIRECT EFFECTS OF INCREASED HUMAN ACTIVITY IN THE TRACT ON CULTURAL RESOURCES

Under the Proposed Action, an estimated 160 employees would work at the mine, with operations occurring 24 hours a day, six days a week, over a projected mine life of 25 years. This increased human presence would have an unquantifiable but potentially great impact on the integrity of NRHP-eligible archaeological sites in the tract that occur on the surface but are not directly affected by pit disturbance or facilities construction. In particular, it could increase vandalism, looting, or unintentional destruction of archaeological sites during the course of mine operations.

As noted in the previous section, there are 45 archaeological sites, 35 of which are eligible for the NRHP, located either partially or wholly in the tract's no-coal zone outside of the centralized facility area. All these sites could be affected by vandalism, looting, or unintentional destruction to a much greater degree than would be the case under the No Action Alternative, although the magnitude of such impacts cannot be estimated precisely.

4.4.5.7 OTHER INDIRECT EFFECTS ON CULTURAL RESOURCES IN THE TRACT

As noted in the Native American Consultation section, natural landscape features (e.g., springs and creeks), resource harvesting and processing areas, and archaeological sites are significant to the Native American tribes in the region for cultural and spiritual reasons (Zweifel 2008). As such, visual, auditory, and other atmospheric impacts from surface-mining activity under the Proposed Action may substantially degrade the integrity of setting, feeling, and association of TCPs that are not directly affected by pit disturbance or facilities construction. These are not impacts that can be quantified, but they would be a major concern for consulting tribes.

4.4.5.8 EFFECTS OF COAL TRUCK TRAFFIC ON CULTURAL RESOURCES

As discussed in the Cultural Resources along the Coal Haul Transportation Route section, the reasonably foreseeable coal haul transportation route under the Proposed Action (see Map 2.5) would pass through the NRHP-listed Panguitch Historic District and would follow Utah Heritage Highway 89 (see Map 3.7), which is part of the Mormon Pioneer Heritage Area. The coal haul transportation route that is used for analysis purposes is the most reasonably foreseeable route, but it is impossible to predict the exact route that a successful bidder might choose. The Panguitch Historic District is significant under NRHP Criterion A for its association with the early settlement of Panguitch and with the subsequent economic development of the area, and it is significant under Criterion C for its intact concentration of historic buildings. The Mormon Pioneer Heritage Area was established in recognition of the role that Mormon settlement played in the Euro-American colonization of the West, and its purpose includes fostering conservation and interpretation of cultural and natural resources, as well as economic development related to the region's heritage.

Under the Proposed Action, it is projected that 153 coal truck round-trips per day would occur six days per week over a projected mine life of 25 years. A traffic analysis conducted for this EIS indicates that the portion of US-89 that corresponds to the coal haul transportation route presently experiences average traffic volumes ranging in various locations from approximately 3,600 to 4,100 vehicles per day, of which between 720 and 900 vehicles per day are heavy trucks (Fehr & Peers Transportation Consultants 2013). Projected total traffic volumes for the year 2020 on US-89 (without the addition of coal trucks) range from 4,400 to 5,850 vehicles per day (Fehr & Peers Transportation Consultants 2013). The coal truck traffic that would result from the Proposed Action would be an incremental addition to the existing and projected future traffic volumes. Compared to present levels, it would represent an increase in truck traffic volume of approximately 17%–21%, six days per week. Possible impacts to cultural resources from this incremental increase in truck traffic could include physical damage to historic buildings from traffic-generated vibrations, as well an alteration of the integrity of setting, feeling, and association of the Panguitch Historic District and the Utah Heritage Highway 89/Mormon Pioneer Heritage Area.

The California Department of Transportation has presented a technical advisory on transportation-related vibrations (CALTRANS 2002). The results in this advisory suggest that neither existing truck traffic nor the addition of further coal truck traffic should physically affect historic buildings. This technical advisory suggests that a peak particle velocity (i.e., velocity of soil particles) of 5.0 millimeters/second (mm/s) is the threshold at which there is a risk of architectural damage (i.e., damage to finish materials) to “normal dwellings,” such as houses with plastered walls and ceilings. The advisory further suggests that minor structural damage would not occur until peak particle velocities of 10–15 mm/s are reached. Finally, the advisory recommends that “ruins and ancient monuments” not be subjected to peak particle velocities of greater than 2.0 mm/s. In contrast to these threshold levels, the advisory reports that the highest measured traffic-generated vibrations from heavy trucks, measured on freeway shoulders at a distance of 5 m (16 feet, five inches) from the center line of the nearest lane, have never exceeded 2.0 mm/s. Vibration velocity declines exponentially with distance from the source, and because buildings along the coal transportation route are located much farther than 5.0 mm/s m from the center line of the closest traffic lane, it is unlikely that buildings along the route would ever experience vibrations that even approach the recommended maximum for “ruins and ancient monuments,” much less the threshold at which architectural damage to “normal dwellings” might occur. Vibration velocity does depend on the road surface, and vibrations could be further minimized by filling potholes and cracks (CALTRANS 2002).

Although it is unlikely that the additional truck traffic would result in physical damage to historic buildings along the coal haul transportation route, there is perhaps a greater chance that it could adversely affect the integrity of setting, feeling, and association of the Panguitch Historic District, the Utah Heritage Highway 89/Mormon Pioneer Heritage Area, or both. In particular, the increased traffic could result in increases in noise, air pollutants, and traffic congestion in downtown Panguitch and along US-89, thereby adversely affecting the historic feeling of the area for residents and visitors; such impacts are considered in greater detail in the aesthetic resources, air resources, and traffic sections of this document. Portions of US-89 along the coal haul transportation route currently experience heavy truck traffic of between 720 and 900 vehicles per day. As such, heavy truck traffic is part of the experience of the Panguitch Historic District and the Utah Heritage Highway 89, and the additional volume of 153 trucks per day would represent only an incremental increase against this baseline. In addition, mining is one of the historic uses of the region that was considered in establishing the region as a heritage area, and from this perspective coal truck traffic is not inconsistent with the heritage of the area.

4.4.5.9 SUMMARY OF EFFECTS ON CULTURAL RESOURCES UNDER THE PROPOSED ACTION

Under the Proposed Action, 75 NRHP-eligible archaeological sites would be completely or partially destroyed by surface mining on 1,750 acres, and four NRHP-eligible archaeological sites would be completely or partially destroyed by construction of centralized facilities on 36 acres. As many as two NRHP-eligible archaeological sites would be impacted by the relocation of KFO Route 116, and an estimated five NRHP-eligible sites would be impacted by the construction of dispersed facilities on 160 acres out of 1,183 acres available for dispersed facility construction. The complete or partial destruction of archaeological sites under the Proposed Action are impacts that would not occur under the No Action Alternative because the No Action Alternative would not result in mining the tract. However, it is uncertain how many sites would be completely or partially destroyed when considering impacts from the current land uses discussed in the No Action Alternative.

Mitigation for the loss of eligible archaeological sites would be the information about regional prehistory and history that would be gained from archaeological testing and data recovery to be conducted as stipulated in the PA. An unknown number of archaeological sites not identified during the cultural resources inventory for the tract (e.g., buried sites without surface manifestations) might be impacted by pit disturbance, construction of centralized or dispersed facilities, or KFO Route 116 relocation, but such impacts would be mitigated by avoidance if possible (in the case of KFO Route 116) or through monitoring and possibly data recovery (if selected to be added to the sample of sites for data recovery). At present, one NRHP-eligible archaeological site has been identified within the 613 surface acres that are susceptible to subsidence from underground mining that would occur under the 200-foot overburden removal scenario, and the specific method of underground mining to be adopted is unknown. Thus, the effects of subsidence on archaeological sites cannot be evaluated quantitatively, although there is some chance that they could occur.

Sites that are not directly impacted by surface mining or facilities construction would be subject to a greater degree of threat for vandalism, looting, or unintentional destruction due to an increased human presence in the area. Native American TCPs, which include natural features as well as archaeological sites, would be subject to adverse effects to their integrity of setting, feeling, and association due to visual, auditory, and other atmospheric impacts from mining activity. Although not quantifiable, these impacts would be a major concern for the tribes that would be consulted.

The incremental increase in truck traffic through the Panguitch Historic District and along the Utah Heritage Highway 89 that would occur under the Proposed Action would likely not cause physical damage to historic buildings along the route. However, it likely would have some adverse effect on the integrity of setting, feeling, and association of these resources.

4.4.6 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Under Alternative C, total projected surface disturbance would occur on 1,662 acres. The number of archaeological sites impacted by surface mining would be 83, of which 69 are eligible for the NRHP (compared to 75 NRHP-eligible sites affected by surface mining under the Proposed Action). Based on assumptions described for Alternative C in Section 4.1, the number of sites affected by the relocation of KFO Route 116 would be reduced from a maximum of four to a maximum of three, of which two are eligible for the NRHP (the same maximum number of NRHP-eligible sites affected by road relocation under the Proposed Action). The number of sites that would be located either partially or wholly in the area available for construction of dispersed facilities under Alternative C would be reduced from 45 to 43, of which 34 (rather than 35) are eligible for the NRHP. Applying the same percentage used to estimate impacts from dispersed facilities under the Proposed Action (13.5%), it can be estimated that the number of sites affected by dispersed facilities would not differ appreciably from the Proposed Action—that is, six sites would be affected, including five that are NRHP eligible. Impacts from underground mining and centralized facility construction would be the same as those described for the Proposed Action. Effects of increased human activity in the tract (e.g., increased threat of looting through increased access), other indirect effects (e.g., effects on the setting and feeling of TCPs), and effects from coal truck traffic would be reduced in proportion to a reduction in mine life from 25 to 21 years. Impacts from surface mining, facilities construction, and road relocation activities to sites not previously identified during cultural resource inventories would be reduced roughly in proportion to the reduction in total surface disturbance from 1,993 acres to 1,662 acres. Alternative C would increase the complete or partial destruction of archaeological sites on the tract compared to the No Action Alternative because no mining would occur on the tract under No Action. However, it is not known how many sites would be completely or partially destroyed when considering impacts from the current land uses discussed for the No Action Alternative.

4.4.7 Alternative K1: Reduced Tract Acreage

Under Alternative K1, total projected surface disturbance would occur on 1,012 acres. The number of archaeological sites impacted by surface mining would be 40, of which 29 are eligible for the NRHP (compared to 75 NRHP-eligible sites affected by surface mining under the Proposed Action). Based on assumptions described for Alternative K1 in Section 4.1, three sites would be affected by the relocation of KFO Route 116, of which two sites are NRHP-eligible. The number of sites that would be located either partially or wholly in the area available for construction of dispersed facilities under Alternative K1 would be 38. Applying the same percentage used to estimate impacts from dispersed facilities under the Proposed Action (13.5%), it can be estimated that five sites would be affected by dispersed facilities, of which four are NRHP-eligible. Impacts from underground mining and centralized facility construction would be the same as those described for the Proposed Action. Effects of increased human activity in the tract (e.g., increased threat of looting through increased access), other indirect effects (e.g., effects on the setting and feeling of TCPs), and effects from coal truck traffic would be reduced in proportion to a reduction in mine life from 25 to 16 years. Impacts from surface mining, facilities construction, and road relocation activities to sites not previously identified during cultural resource inventories would be reduced roughly in proportion to the reduction in total surface disturbance from 1,993 acres to 1,012 acres. Alternative K1 would increase the complete or partial destruction of archaeological sites on the tract compared to the No Action Alternative because no mining would occur on the tract under No Action. However, it is not known how many sites would be completely or partially destroyed when considering impacts from the current land uses discussed for the No Action Alternative.

4.4.8 Potential Mitigation Measures

Mitigation measures would consist of a combination of avoidance, monitoring, and conducting archaeological testing and, if warranted, data recovery at sites that would be affected by the Proposed Action as stipulated in the tract’s PA. The PA stipulates that an HPTP that addresses adverse effects to NRHP-eligible properties would be prepared before mining activities start. Effects to prehistoric and historic archaeological sites, historic architecture, and TCPs would all be considered in the HPTP. Mitigation of adverse effects to prehistoric or historic archaeological properties would be conducted in phases. Phase I mitigation would include archaeological testing of NRHP-eligible and unevaluated sites to determine the potential for each site to provide necessary information to address relevant local and regional research issues. Phase II mitigation would involve data recovery excavation at those sites identified during Phase I mitigation to contain data relevant to local and regional research issues. Also as stipulated in the PA, the HPTP would include a Native American Graves Protection and Repatriation Act plan of action, an inadvertent discoveries plan, and a monitoring plan.

Employee education regarding the treatment of cultural resources and the restriction on access to inactive mining areas could also be included as a potential mitigation measure when managing cultural resources.

4.4.9 Unavoidable Adverse Impacts

Unavoidable impacts, or impacts that exist even after mitigation measures have been taken, would principally manifest through the destruction of all cultural resources in areas targeted for surface mine pit disturbance. For previously identified sites that are included in the sample of sites to be excavated, even though impacts would be mitigated through the collection of information about the prehistory and history of the area, materials from those sites would forever be removed from their original context. Unavoidable damage to cultural resources could also occur if resources not identified during surveys are affected during ground disturbance, despite the implementation of a monitoring plan for mitigation purposes. Unavoidable loss of cultural resources due to nonrecognition, lack of information and documentation, increased erosion, and inadvertent damage or use could also occur.

4.4.10 Short-Term Uses versus Long-Term Productivity

Cultural resources that are wholly eliminated due to short-term uses such as scientific data recovery efforts and data recovery supporting surface-disturbing activities would no longer be available for further study. Therefore, the long-term productivity of the resources (e.g., their ability to provide additional data) is also reduced. Short-term uses comprising the actual mining of coal would have the combined effect of destroying sites as well as increasing threats (such as looting) to sites outside of the actual disturbance areas through increased traffic and public access. Those sites not affected by looting during the active life of the mine may still have some reduced long-term productivity through continued looting or inadvertent destruction as a result of increased access to the region. Natural forces such as erosion would also continue to affect cultural resources, and it is likely that these resources would suffer deterioration and loss of data as a result.

4.4.11 Irreversible and Irretrievable Commitments of Resources

The implementation of laws that protect cultural resources would provide mitigation of impacts from permitted activities. However, the development of a surface coal mine would impact a large number of sites. Such a large number of NRHP-eligible sites would make mitigation through full data recovery an impractical solution for every resource, and a testing strategy in advance of data recovery would consequently be implemented, as stipulated in the PA. For sites that are excavated, even though data would be recovered through scientific research, excavation and subsequent destruction through mining activities would result in an irreversible commitment of resources.

Several irretrievable commitments of resources would also occur. During the active lifetime of the mine, cultural resources not otherwise impacted by direct mining effects would be under increasing threat of looting for a period of time. In addition, cultural resources in the tract would not be available to Native Americans for traditional uses or to scholars for research purposes for a period of time. The loss of integrity of setting and feeling that the Panguitch Historic District and the Utah Heritage Highway 89/Mormon Pioneer Heritage Area would experience during transportation of coal to markets would also constitute an irretrievable commitment of resources. Because these impacts would be temporary, lasting only for the life of the mine, they would be irretrievable rather than irreversible.

4.5 Fire Management

This section discusses the impacts of the Proposed Action and alternatives as described in Chapter 2 on FRCC acreages in the Alton Coal Tract. Impacts would vary by alternative and would depend on specific actions that could directly or indirectly reduce or contribute to fuels loading or increase or decrease the risks of wildland fire.

4.5.1 Regulatory Framework

Although no specific regulations or additional design features are in place for fire activities, the successful bidder would follow internal protocol and BLM BMPs to reduce and mitigate fire risk.

4.5.2 Impact Indicators and Thresholds

Acres of surface disturbance in vegetation communities in each FRCC would be used as the primary indicator of impacts from implementation of the alternatives. Surface disturbance would mainly be incurred by minerals development and by the construction of facilities and roads as planned under the action alternatives.

FRCCs are categories that describe the degree of departure of vegetation communities from the central tendency of reference ecosystems (see Section 3.5.3.1 in Chapter 3). Central tendency is a composite estimate of fuel composition, fire severity and frequency, and other characteristics of an ecosystem. There are three FRCC categories: FRCC 1 consists of areas having no to low departure from reference communities, FRCC 2 consists of areas with moderate departure, and FRCC 3 consists of areas with high departure (Hann et al. 2001). These departures are largely caused by changes to vegetation structure and composition through improper grazing, fire suppression, and exotic annual weed invasion. In the tract, 99.7% of all the vegetation types (excluding open water and acres of roads) are in FRCC 2 and FRCC 3 (see Map 3.9).

A secondary indicator of impacts to fire regimes in the tract would be the construction and presence of new roads. Because of the potential for vehicle traffic to start wildfires, increased travel in the tract could lead to a greater risk of human-caused wildfires. Also, increased machinery operation during construction of facilities could lead to a greater wildfire risk. Acres of land designated for facilities construction would also be a secondary indicator of impacts to fire regimes in the tract.

4.5.3 Analysis Assumptions

Lightning accounts for 78% of all fires in the KFO area. Human activity such as careless smoking, vehicle exhaust, sparks from machinery or vehicles, escaped agricultural burning, and unattended campfires accounts for the remaining 22% (BLM 2004). However, alterations to vegetation community structure and composition that create conditions for frequent wildfires are, to some extent, all a result of human activity. Regardless of the initial cause of the fire, wildfires in unreclaimed disturbed areas (i.e., FRCC 2 and 3) tend to occur more frequently and cause more damage than wildfires in natural or reference conditions (BLM 2004). For the purposes of this analysis, vegetation disturbance and FRCC rating would be considered the most important factors in determining wildfire risk, although risk due to new road and facilities construction is also discussed.

For this analysis, it is assumed that post-operational revegetation would be successful and that revegetated vegetation communities would be less susceptible to wildfires than they are currently. Under both of the action alternatives, approximately 43% of pinyon-juniper communities in the tract would be cleared for mine or facilities construction (see Section 4.15). Because all pinyon-juniper communities in the tract are considered to be a result of invasive plant encroachment, these areas would not be restored to current vegetation community structures post-operation but would be revegetated with sagebrush and perennial grassland species. Permanent removal of 43% of the vegetation in these communities would greatly reduce the overall fuel load in the tract. It is possible that the FRCC rating would be improved following revegetation, and the risk of catastrophic wildfires in the tract would be reduced in the long term.

It is also assumed that revegetated areas would only be subject to minimal, long-term invasive, annual weed species encroachment. This assumption is based on agency objectives for reclamation and on the relatively small amounts of invasive annual weed species observed in past revegetation projects in the area (Reese 2008).

Preventive standard operating procedure (SOPs) would be followed during all mine operations to minimize risk of equipment-started fires.

4.5.4 Actions that Would Cause Change to Existing Fire Conditions

Clearing of vegetation for mines, roads, and facilities would create a short-term reduction in fuel loading and fire frequency. There would be less risk of wildfires prior to reclamation, when these areas are not occupied with vegetation. These cleared areas would also act as firebreaks between vegetated areas. Increased vehicle traffic to and from mining operations would result in an increased risk of vehicle-caused ignitions that could start wildfires. However, new roads would also provide better access for firefighters in the case of a wildfire.

Because 99.7% of land in the tract is classified as FRCC 3, restoration of native vegetation communities would be expected to improve vegetation community quality and fire regime classifications. If the revegetation of vegetation communities at the completion of mining activities is successful, it could shift the lands' FRCC rating from high to low levels of departure from central tendencies of reference ecosystems.

All action alternatives analyzed would be compliant with the *Southern Utah Support Area Fire Management Plan* (BLM 2005c). Thus, leasing the tract, mining activities on the tract, and coal hauling along the reasonably foreseeable coal haul transportation route would not affect the BLM's ability to conduct prescribed burning to reduce threats of wildfire.

Impacts of actions under each alternative are discussed in the following sections.

4.5.4.1 ALTERNATIVE A: NO ACTION

Under the No Action Alternative, ACD's application to lease the coal included in the tract under the Proposed Action or Alternative C would not be approved, the tract would not be offered for competitive lease sale, and the coal included in the tract would not be mined.

No coal-mining activities or infrastructure development would occur under the No Action Alternative on the tract. Likewise, no acres of vegetation communities would be disturbed by these activities, and no change in the FRCC rating would result. Furthermore, no acres in the tract would be revegetated or have the potential to decrease in FRCC rating as a function of mining.

Management of vegetation on BLM-administered lands in the tract would continue at the discretion of the BLM under the KFO RMP. These treatments are generally used to restore sagebrush grasslands that have been invaded by pinyon-juniper woodland for ecosystem restoration and watershed health. In the short term, vegetation treatments could increase the risk of invasion by noxious weeds and invasive species by vegetation removal and ground disturbance. Under the No Action Alternative, the removal of pinyon-juniper woodlands would reduce fuel loads in the tract. However, the approximate percentage of tract to be treated under the No Action Alternative in the short and long term is not known at this time.

Implementing general treatment design features such as 1) using prescribed burning in lieu of mechanical treatment when deemed suitable, 2) evaluating treatment sites for soil suitability and stability prior to manipulation, and 3) excluding livestock from all treatment areas until seedlings are established would help facilitate reestablishment of vegetation communities. Using desired species of grasses, forbs, and browse in the rehabilitation and reseeding of treated areas would facilitate vegetation reestablishment and avoid creating single-species communities.

Vegetation treatments, if successful, would have long-term benefits to the ecology of the area by removing undesired species, increasing species diversity and age class of certain communities, improving vegetation composition and structure, increasing overall vegetation cover, and improving FRCC rating. This could result in healthier woodlands, upland communities, and riparian areas that are more capable of retaining moisture and nutrients and resisting disease, invasive species, drought, fire, and other natural disturbances and/or stressors.

4.5.4.2 ALTERNATIVE B: PROPOSED ACTION

Under the Proposed Action, the tract would be offered for lease at a sealed-bid, competitive lease sale subject to standard and special lease stipulations developed for the tract. The boundaries of the tract under the Proposed Action (see Map 1.2) would be reasonably consistent with the tract reconfiguration completed by the BLM after ACD's original LBA submittal (see Map 2.7).

4.5.4.2.1 Vegetation Removal

Approximately 1,733 acres of surface disturbance in vegetation communities would result from surface-mining operations (pit disturbance) under the Proposed Action. Centralized facilities associated with mining activities on the tract would remove approximately 36 acres of vegetation on BLM-administered land in the tract's no-coal zone (areas outside of pit disturbance boundaries) (see Map 1.2). Other dispersed facilities would result in approximately 160 acres of vegetation removal. Relocation of KFO Route 116 in the tract would also remove approximately 47 acres of vegetation. This leads to approximately 1,975 acres of vegetation removed due to mining and facilities construction. This is 55% of the vegetation in the tract.

Under the management objectives described in Chapter 2, this entire acreage (1,975 acres) would be revegetated with suitable native and non-native species. Invasive annual grasses such as cheatgrass would be suppressed. This could lead to an improved FRCC rating on these revegetated areas due to the suppression of cheatgrass and the return of the vegetation community to one with a fire regime of less frequent and lower intensity fires.

Under the Proposed Action, as well as all other action alternatives, Block Sa (186.2 acres) would not be mined and the lessee would apply pre-mining vegetation treatments to the block. The proposed vegetation treatments would break up continuous fuels and reduce the risk of wildfire entering sensitive sagebrush areas. These enhancements would help create a variety of age classes of sagebrush and would reduce the potential for high-intensity fire. Removing and/or thinning pinyon-juniper in a mosaic pattern would also break up continuous fuels and reduce the risk of a high-intensity wildfire. Because there is a greater risk of conversion of shrublands to annual grasslands under a high-intensity fire, managed vegetation treatments would reduce the likelihood of cheatgrass invasion and help native grasses and forbs persist long term.

4.5.4.2.2 Wildfire Risk Due to Increased Access to Tract and Construction of Facilities

Under the Proposed Action, approximately 6.5 miles of new roads would be constructed due to the relocation of KFO Route 116. This increase in new road, when compared to the No Action Alternative, would result in an increased risk of human-caused wildfires from construction activities.

The construction of centralized and dispersed facilities on 196 acres under the Proposed Action could lead to an increased risk of human-caused wildfires from construction activities in undisturbed vegetation on and adjacent to the tract as compared with the No Action Alternative, where no facilities would be constructed.

The Western Utah RWPP does not consider the town of Alton as a state-identified community at risk of wildfire. However, the RWPP does identify WUI areas immediately west of the town, along the length of US-89, as well as the Spencer Bench, Spencer Cliff Estates, and Stout Canyon area. The RWPP risk assessment identifies a high wildfire risk in these areas (FCAOG 2007b), which include portions of the coal haul transportation route.

4.5.4.2.3 Wildfire Risk Due to Increased Vehicle Trips

Increased movement to and from the tract by construction equipment and coal haul trucks would increase the risk of fuel leakage and/or sparking that could lead to wildfires in the tract and adjacent transportation corridors. An estimated 153 coal haul vehicle round-trips per day are expected under the Proposed Action.

The number of projected employee vehicle trips is expected to increase under this alternative as compared to the No Action Alternative. These trips would also lead to increased wildfire risk due to fuel leakages and sparking.

The risk of spontaneous combustion of coal in haul trucks, coal storage piles, refuse piles, and exposed coal faces would also increase as a result of mining activities. Under the DOGM's coal-mine permitting application requirements (Rule R645-301), the successful bidder would be required to follow all regulations regarding fire prevention and response.

4.5.4.3 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

Under Alternative C, the tract would be modified to exclude Block NW of the tract near the town of Alton (see Map 2.2). Furthermore, certain mining activities in Block S would be subject to seasonal restrictions to reduce impacts to the local sage-grouse population. The boundaries of the modified tract would be reasonably consistent with the configuration shown in Map 2.2.

4.5.4.3.1 Vegetation Removal

Approximately 1,443 acres of surface disturbance in vegetation communities would result from surface-mining operations (pit disturbance) under Alternative C. Centralized facilities associated with mining activities on the tract would remove approximately 36 acres of vegetation on BLM-administered land (see Map 2.2). Other dispersed facilities would result in approximately 135 acres of vegetation removal. Relocation of KFO Route 116 in the tract would also remove approximately 36 acres of vegetation. This leads to 1,650 acres of vegetation that would be removed due to mining and facilities construction. This is 52% of the vegetation in the tract.

Under the management objectives described in Chapter 2, this entire acreage (1,650 acres) would be revegetated with suitable native and non-native species. Invasive annual grasses such as cheatgrass would be suppressed. This could lead to an improved FRCC rating on these revegetated areas due to the suppression of cheatgrass and the return of the vegetation community to one with a fire regime of less frequent and lower intensity fires.

4.5.4.3.2 Wildfire Risk Due to Increased Access to Tract and Construction of Facilities

Under Alternative C, approximately 4.6 miles of new roads would be constructed due to the relocation of KFO Route 116. This increase in new roads, when compared to the No Action Alternative, would result in an increased risk of human-caused wildfires from construction activities.

The construction of centralized and dispersed facilities on 171 acres under Alternative C would lead to an increased risk of human-caused wildfires from construction activities in undisturbed vegetation on and adjacent to the tract when compared to the No Action Alternative, where no facilities would be constructed.

4.5.4.3.3 Wildfire Risk Due to Increased Vehicle Trips

Increased movement to and from the tract by construction equipment and coal haul trucks would increase the risk of fuel leakage and/or sparking that could lead to wildfires in the tract and adjacent transportation corridors. An estimated 153 coal haul vehicle round-trips per day are expected under Alternative C.

The number of projected employee vehicle trips would be greater than under the No Action Alternative and the same as the Proposed Action; however, the number of trips would last for 21 years as opposed to 25 under the Proposed Action. These trips would also lead to increased wildfire risk due to fuel leakages and sparking.

4.5.4.4 ALTERNATIVE K1: REDUCED TRACT ACREAGE

Under Alternative K1, the tract would be modified to exclude Block NW of the tract near the town of Alton and Block S (see Map 2.3).

4.5.4.4.1 Vegetation Removal

Approximately 861 acres of surface disturbance in vegetation communities would result from surface-mining operations (pit disturbance) under Alternative K1. Centralized facilities associated with mining activities on the tract would remove approximately 36 acres of vegetation on BLM-administered land (see Map 2.3). Other dispersed facilities would result in approximately 92 acres of vegetation removal. Relocation of KFO Route 116 in the tract would also remove approximately 16 acres of vegetation. This leads to 1,005 acres of vegetation that would be removed due to mining and facilities construction. This is 48% of the vegetation in the tract.

Under the management objectives described in Chapter 2, this entire acreage (1,005 acres) would be revegetated with suitable native and non-native species. Invasive annual grasses such as cheatgrass would be suppressed. This could lead to an improved FRCC rating on these revegetated areas due to the suppression of cheatgrass and the return of the vegetation community to one with a fire regime of less frequent and lower intensity fires.

4.5.4.4.2 Wildfire Risk Due to Increased Access to Tract and Construction of Facilities

Under Alternative K1, approximately 2 miles of new roads would be constructed due to the relocation of KFO Route 116. This increase in new roads, when compared to the No Action Alternative, would result in an increased risk of human-caused wildfires from construction activities.

The construction of centralized and dispersed facilities on 128 acres under Alternative K1 would lead to an increased risk of human-caused wildfires from construction activities in undisturbed vegetation on and adjacent to the tract when compared to the No Action Alternative, where no facilities would be constructed.

4.5.4.4.3 Wildfire Risk Due to Increased Vehicle Trips

Increased movement to and from the tract by construction equipment and coal haul trucks would increase the risk of fuel leakage and/or sparking that could lead to wildfires in the tract and adjacent transportation corridors. An estimated 153 coal haul vehicle round-trips per day are expected under Alternative K1.

The number of projected employee vehicle trips would be greater than under the No Action Alternative and the same as the Proposed Action; however, the number of trips would last for 16 years as opposed to 25 under the Proposed Action. These trips would also lead to increased wildfire risk due to fuel leakages and sparking.

4.5.5 Potential Mitigation Measures

No potential mitigation measures are proposed for fire management.

4.5.6 Unavoidable Adverse Impacts

The risk of wildfire ignition would be an unavoidable impact under the Proposed Action, Alternative C, and Alternative K1. Restoration of native vegetation communities would be expected to improve vegetation community quality and fire regime classifications.

4.5.7 Short-term Uses versus Long-term Productivity

In the short term, areas cleared of vegetation for construction of mined areas, facilities, or roads would be removed from FRCC rating. These areas would serve as firebreaks in the event of wildfires in adjacent areas. At the completion of mining activities, these areas would be revegetated under the mitigation measures set out in Chapter 2. Revegetation has the potential to improve the tract's FRCC ratings. In the long term, the revegetation of 1,975 acres of land (55.6%) under the Proposed Action, 1,650 acres of land (52.2%) under Alternative C, and 1,005 acres of land under Alternative K1 would remove a large area of land from this high FRCC rating and therefore help this area move toward a more natural fire regime.

4.5.8 Irreversible and Irretrievable Commitments of Resources

The protective measures detailed in Chapter 2 require the reclamation of disturbed areas following the completion of mining. Because vegetation resources would be restored or rehabilitated after the proposed disturbance and/or development, there would be no anticipated irreversible impacts on native vegetation resources or fire regimes associated with the management decisions proposed for the tract. However, there would be irretrievable impacts associated with the surface-disturbing activities proposed throughout the planning area. Any native, fire-resistant vegetation that would be removed or disturbed would be an irretrievable loss until successful restoration took place.

4.6 Geology and Minerals

The analysis area for geology and minerals is primarily the Alton Coal Tract under all action alternatives. However, the area north and northeast of the tract's underground mining portion of mining block C, extending 405 feet beyond the tract boundaries (an area of approximately 166 acres outside the tract boundary), is also included (Map 4.5). This area is within what is known as the "angle of draw" or "angle of influence" (hereafter referred to as the angle of influence) for the underground mine portion of the tract. The angle of influence defines the extent of the surface area affected by ground movement that occurs as a result of removing coal from an underground mine where overlying rock layers are no longer supported by underlying coal removed during mining. Above the mine workings of an underground mine, rock movements occur vertically and at angles projected away from the mined-out area (Pennsylvania Department of Environmental Protection 2008). The angle of influence varies from approximately 8°–45° depending on the coal field (Bell et al. 2006). This analysis assumes that the angle of influence in this portion of the Alton Coal Field is a maximum of approximately 30°. This is the angle of influence presumed by the DOGM to be the maximum angle in the permitting process unless the permit applicant can demonstrate, and the DOGM can determine, that a site-specific angle of influence would be more appropriate (DOGM 2008). Assuming 1) a 30° angle of influence (as stated), 2) that the overburden depth at the tract boundary is approximately 700 feet, and 3) that the land surface extending beyond the tract boundary is flat, approximately 405 feet of land surface (or approximately 166 total acres) beyond the north and northeastern edge of the tract (as mentioned above) would be affected by underground mining operations in the tract (see Figure 4.6.1 for an illustration of the angle of influence and an explanation of calculations).

4.6.1 Regulatory Framework

4.6.1.1 FEDERAL REGULATIONS

- The MLA authorizes and governs the leasing of public lands for developing coal, petroleum, natural gas, and other hydrocarbons, phosphates, and sodium in the United States.
- The Materials Act of 1947 authorizes the United States government to sell minerals to common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay.
- FLPMA requires that public lands be managed in a manner that will protect scientific, environmental, air and atmospheric, and water resource values. It also requires land use plans to be in compliance with applicable pollution control laws, including state and federal air, water, and other pollution standards.

4.6.1.2 STATE REGULATIONS

- The Coal Mining Reclamation Act of 1979: Utah Rule R645 provides provisions pertaining to the effects of coal mining and reclamation operations and pertaining to coal exploration.
- Coal Mining and Reclamation; UAC 40-10 assures that surface coal mine operations are conducted to protect the environment, that reclamation of mine lands occurs promptly, and that mining operations are not conducted where reclamation is not economically or technologically feasible.
- The DOGM requires the identification of unsuitable overburden materials and selectively placing, mixing chemically, or mixing physically this material to minimize adverse effects to vegetation or groundwater.
- The DOGM requires analysis before mining to detect unsuitable overburden.
- The DOGM requires that topography be restored to AOC.

4.6.2 Alternative A: No Action

Under the No Action Alternative, the BLM would not issue a lease for coal in the Alton Coal Tract. Therefore, the geomorphological surface features, subsurface stratigraphy, and chemical and physical characteristics of the area would not change as a function of coal mining. The current land uses in the tract, which consist of recreation, livestock grazing, and vegetation treatments, would continue in a similar manner to current conditions. Their impacts to the area's geomorphology would remain similar to current conditions. The BLM's current management of burnt shale, gravel, fluid materials, and locatable minerals in and adjacent to the Alton Coal Tract would also remain unchanged as a function of coal mining.

4.6.3 Alternative B: Proposed Action

Under the Proposed Action, the BLM would hold a competitive lease sale for some 49 million tons of coal in the Alton Coal Tract. Under this alternative, the tract includes approximately 3,576 surface acres, roughly 1,296 acres of which are private surface and 2,280 acres of which are federal surface. All coal resources contained in the tract are federally owned. Approximately 1,132 acres of the tract under the Proposed Action do not contain coal (the tract's no-coal zone). Under the Proposed Action, approximately 1,993 surface acres would be disturbed. Of this total acreage, approximately 1,750 acres would be disturbed from pit disturbance (active mining operations), 36 acres would be disturbed for centralized facilities, 160 acres would be disturbed for dispersed facilities, and 47 acres would be disturbed to temporarily relocate KFO Route 116. Additionally, subsidence disturbance could occur over approximately 613 acres of the underground mining area and approximately 166 acres outside the tract boundary but within the assumed angle of influence.

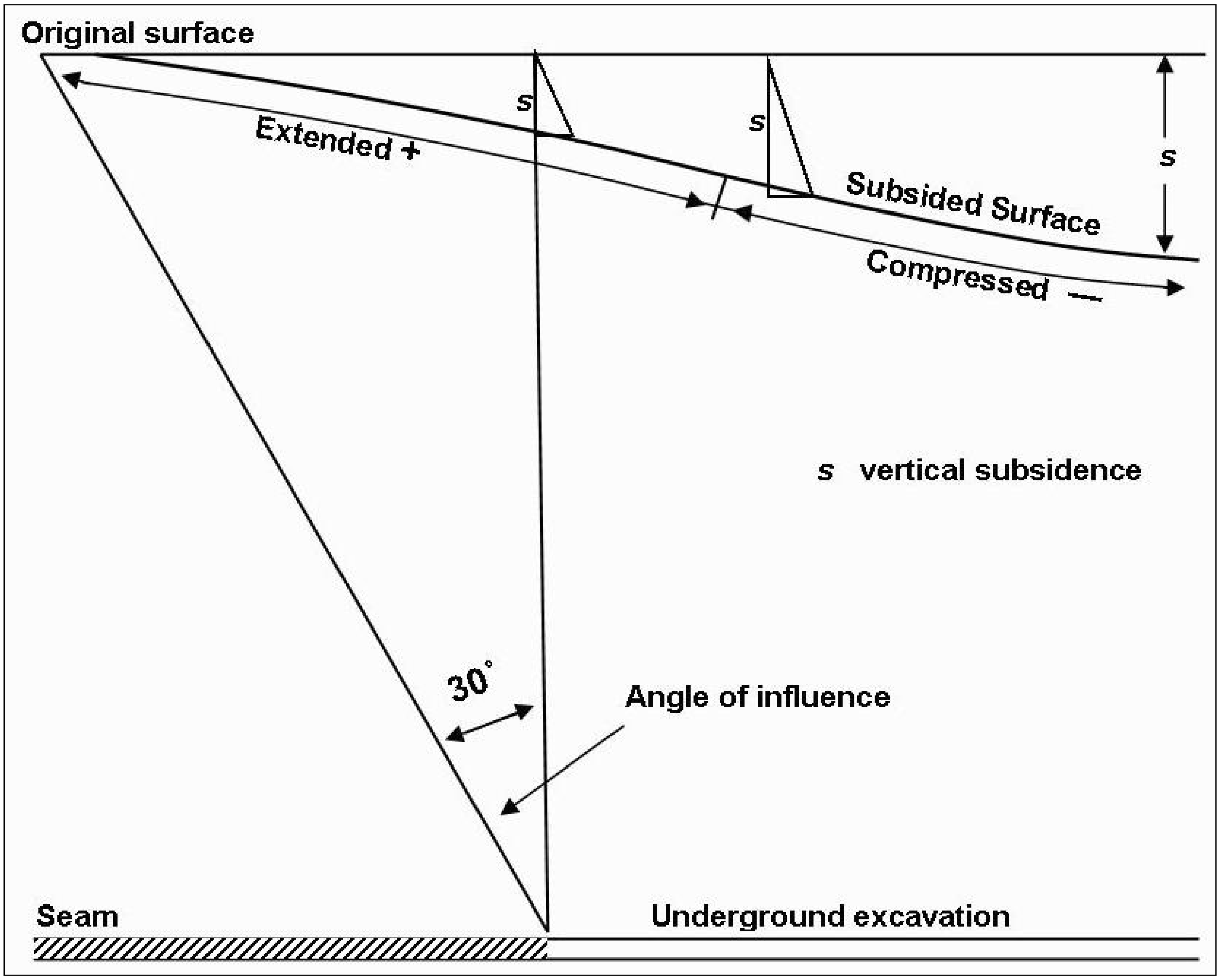

Figure 4.6.1. Angle of influence for underground mining (modified from Bell et al. 2006:91).

Note: The length of the land surface affected by underground mining operations, assuming that the surface is flat, was determined using the tangent function (tan A = o / a). Because the assumed angle of influence (A = 30˚) and the assumed length of the adjacent side or the overburden depth (a = 700′) are available, the length of the opposite side (o) or the land surface affected by underground mining operations was calculated by putting the known numbers into the function to solve for the length of the opposite side equaling 404.13′.

4.6.3.1 IMPACTS TO GEOLOGY, INCLUDING TOPOGRAPHY, PHYSIOGRAPHY, AND STRATIGRAPHY

4.6.3.1.1 Impacts Due to Surface Mining

The surface-mining operation would remove coal and return noncoal material back into the pit on an estimated 1,750 acres (pit disturbance) under the Proposed Action. The geology of the mine pit area would be permanently altered. The replaced overburden material would be similar to pre-mining lithologies; however, the physical characteristics of the material, including permeability and stratigraphy, would be altered through the placement of a mixture of sizes and rock types back into the mined-out pit. The removal and relocation of the overburden would create a blend of the original geologic units. The stratigraphy of the area would also be permanently altered by the removal of the coal layer itself, which is currently a component of the stratigraphic arrangement of rock layers in the tract. The geology underlying Bryce Canyon National Park would not be affected by surface or underground mining on the tract, because the tract is more than 10 miles away from the park.

Like the geology of the mine pit area, the topographical expression of the land surface would be permanently altered. The PMT would be determined during the DOGM permitting process, but in general terms the land would be returned to its AOC (unless a variance or exemption is granted by the DOGM). Alterations in final topography may be approved to improve wildlife habitat for species such as Greater Sage-Grouse, mule deer, and elk. Other alterations in final topography may be approved based on the desires of private surface owners. According to DOGM regulations and procedures, variances or exemptions granted by the DOGM to approve alterations in final topography must follow a process that includes the opportunity for public comment. The removal of the coal seam (approximately 15 feet thick) would not significantly alter the original elevation of the area following reclamation because overburden and topsoil (after excavation and replacement in the mined-out pit) swell by a factor of approximately 30% (Powell 2008). This swelling would compensate for the coal seam's removal. Although the replaced overburden and topsoil would settle slightly over time, the final ground surface elevation would not be significantly different from the tract's original elevation (Table 4.6.1).

Table 4.6.1. Calculation of Pre- and Post-mining Coal and Overburden Depths

	Current Conditions (feet)	**Post Mining, Proposed Action (feet)**	**Post Mining, Alternative C (feet)**	**Post Mining, Alternative K1 (feet)**
Overburden depth (approximate average)	100	120 (100 feet × 1.2 swell factor)	120 (100 feet × 1.2 swell factor)	120 (100 feet × 1.2 swell factor)
Coal seam thickness (approximate average)	15	0	0	0
Total	**115**	120	120	120

Reclamation would therefore result in the replacement of overburden and topsoil and the regrading to AOC (or a contour suitable for post-mining land use subject to the DOGM's variance or exemption regulations and procedures), and may also include the forming of pits and valleys (gouging) on the surface. The outcome would be a gradual overall topography with moonlike surface microbasins of varying depth and width. The DOGM and BLM would approve the final gouge specifications as a function of growth medium properties.

Under the Proposed Action, surface-mining impacts to geology as described above would be long term and adverse because the tract's topography, physiography, and stratigraphy would be permanently altered after mining operations have ceased and after reclamation is complete. The key differences between the Proposed Action, Alternative C, Alternative K1, and the No Action Alternative are shown in Table 4.6.2.

Table 4.6.2. Comparison of Impacts under the No Action Alternative, the Proposed Action, Alternative C, and Alternative K1

Resource Type	Impact Type	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)	Alternative K1 (Reduced Tract Acreage)
Topography, physiography, and stratigraphy	Acres surface mining	0	1,750	1,454	869
	Acres underground mining	0	613	613	613
	Acres within the angle of influence	0	166	166	166
Geologic hazards	Fault hazard from underground mining	No	Yes	Yes	Yes
	Landslide risk	Low	Low	Low	Low
Leasable mineral resources	Production of coal	None	44,900,000 tons	38,100,000 tons	30,000,000 tons
	Impacts to fluid minerals	None	Decreased likelihood of removal due to mining activities	Decreased likelihood of removal due to mining activities	Decreased likelihood of removal due to mining activities
Salable mineral resources	Burial of burnt shale	None	Possible burial	Possible burial	Possible burial
	Burial of gravel	None	Possible burial	Possible burial	Possible burial
Locatable mineral resources	Damage or burial of septarian nodules	None	Possible damage or burial	Possible damage or burial	Possible damage or burial
Underground coal fire	Risk of spontaneous combustion	None	Low	Low	Low

4.6.3.1.2 Impacts Due to Underground Mining

Assuming that surface mining would be feasible up to 200 feet of overburden removal, underground mining would occur beneath approximately 613 acres. Surface impacts from underground mining would generally be limited to the short-term placement of associated surface facilities and subsidence of the land above mined-out portions of the underground mine area and within the 30° angle of influence described above. At a minimum, underground mining operations on the tract would include building a portal, associated pad, and access route. The construction and placement of these facilities would typically require removing and stockpiling topsoil and overburden. However, because surface facilities for underground mining would be placed in areas previously surface mined, these impacts do not represent additional disturbances outside of those previously discussed. Upon completion of mining activities, just as with surface-mining operations, the facilities site would be reclaimed; facilities would be removed and the pit backfilled.

As underground mining operations proceed, removal of the coal would cause subsidence on portions of the Alton Coal Tract overlying the area of coal removal. Subsidence would be in the form of troughs and/or sinkholes formed on the surface, depending in part on the underground mining method used. Overburden geological characteristics (the overall structure and strength of the materials contained in the overburden) also affect subsidence. Sinkholes can present a danger to recreational users and wildlife. Thus, if the tract is leased, a design feature would require the lessee to monitor the mined areas for sinkhole formation and to provide the DOGM and BLM notice of such formation within 24 hours. Sinkholes occur more commonly when room and pillar methods are used, whereas troughs are more typical of long-wall mining operations (Pennsylvania Department of Environmental Protection 2008). The maximum extent of subsidence is a function of the coal seam thickness removed and a (unit-less) subsidence factor that ranges from 0.1 to 0.9 (Bell et al. 2006). Subsidence factors in the western United States range from 0.33 to 0.65 (Bell et al. 2006). To be conservative concerning potential impacts, this analysis assumes the higher of these values (0.65). Assuming that approximately 100% of the coal seam was removed (a conservative assumption for purposes of analysis), surface subsidence in the form of sinkholes and/or troughs directly above the area of coal removal would be up to approximately 9.75 feet. This is calculated by multiplying the thickness of the coal seam removed (15 feet) by the subsidence factor (0.65). In Utah, the effects of subsidence usually consist of surface cracks, general ground lowering, and cliff fracture or failure (Smith 2008). Based on the 30° angle of influence previously described, the effects of subsidence would extend approximately 405 feet beyond the north and northeastern edge of the tract (166 acres). A total of 779 acres including the 613 acres contained in the tract and the 166 outside of the tract boundary would be disturbed. Subsidence in this area would generally be less pronounced than in areas directly overlying those of coal removal (as illustrated in Figure 4.6.1), and would gradually taper toward the outside extent of this area. Surface impacts of underground mining as described would be permanent (long term) and adverse to the topography of the area because it would not be possible to resupport subsided areas. Impacts to stratigraphy from underground mining would also be permanent (long term) and adverse because the removal of the coal seam (a layer making up the stratigraphy of the area) and the lowering of subsided rock layers compared to surrounding rock layers that remain supported cannot be reversed. No mitigation measures for impacts to topography and/or stratigraphy are required by the DOGM. However, impacts to associated resources (e.g., water—surface and groundwater—which is the resource most commonly impacted by subsidence) would be repaired in accordance with DOGM rules and regulations and federal lease terms and stipulations. Mechanisms and methods used to repair damage to resources vary depending on the nature of the damage and the resource (Burton 2008).

Both surface and underground mining can pose risks to the health and safety of mine workers. These risks include injuries, illnesses, and even death. These risks can be exacerbated by things such as accidents, inadequate safety measures, inadequate training, and seismic activity. MSHA helps reduce these risks by developing and enforcing safety and health rules for all United States mines, and by providing technical, educational, and other types of assistance to mine operators. If the tract is leased, the lessee would be required to comply with all applicable MSHA rules and all other regulations related to mine safety.

4.6.3.2 IMPACTS RELATED TO GEOLOGIC HAZARDS

4.6.3.2.1 Faults

The area around the tract has been shown to experience seismic activity of low frequency, ranging from magnitudes of 1.0–3.6 on the Richter Scale. A magnitude 4.5 earthquake occurred on January 3, 2011, in the Tushar Mountains, approximately 8 miles northwest of Circleville, Utah (and approximately 70 miles north of the tract) (University of Utah 2011). A more recent earthquake of magnitude 3.6 occurred on February 11, 2012, approximately 2.4 miles northwest of Panguitch, Utah (and approximately 36 miles north of the tract) (University of Utah 2012). The probability of seismic events associated with any or all of the faults in the area (see Section 3.6) impacting mining and reclamation operations at the Alton Coal Tract is fairly low (DuRoss 2008). However, depending on the frequency and magnitude of seismic events and the stability of mine highwall construction, earthquakes could cause highwall failure (DuRoss 2008). Also, blasting activities would have the potential to initiate seismic activities on the tract. All highwalls and other mine-related structures would be required to comply with DOGM and MSHA safety regulations. Compliance with these regulations would limit or eliminate safety concerns with respect to seismic activity in the area.

The tract is shown on the USGS National Seismic Hazard Maps (2008) as having a 2% probability of exceeding a peak horizontal acceleration of between 20% and 30% of the acceleration due to gravity. This is above the 10% of gravity that is often assumed to be the threshold for damage to weak construction, such as unreinforced masonry buildings (Pechmann 2008). Although these are not particularly high hazards, large earthquakes are possible throughout Utah. The hazard to workers and equipment in a mine from seismic events is highly dependent on local conditions. Where coal is exposed and under considerable pressure, small events may cause considerable spalling (breaking up into chips or fragments) and other damage. If mines are stable, they may not experience any damage from large events (Pechmann 2008).

In many parts of Utah where mining is common, the seismic hazard from mining-induced seismic events can be greater than that from natural events (Pechmann 2008). The coal-mining process often induces seismic events due to subsidence, room collapse, and forces from the removal of coal and overburden. Seismicity associated with underground longwall mining of coal is strongly influenced by depth of cover, lithology of strata above and below the coal seam, and coal strength. Events ranging from 3.3 to 4.2 in magnitude have been observed at mines in the Wasatch Plateau–Book Cliffs region. Mining-induced events of up to magnitude 3.9 have been estimated as possible elsewhere in Utah (Arabasz et al. 2002), and would be possible under the Proposed Action.

4.6.3.2.2 Landslides

Landslide deposits are present at the Straight Cliffs/Tropic Shale contact (see Section 3.6). The deposits are located in a small portion of the tract's northwestern-most corner (see Map 3.10). At this contact, sandstone blocks of the Straight Cliffs Formation have moved onto the Tropic Shale. This condition has been facilitated by the presence of perched groundwater that has created a broad area of hummocky topography at the base of and adjacent to the Straight Cliffs (at the east of the Alton Amphitheater). Because these hummocky areas tend to hold moisture and because seeps are common, the potential for landslides exists where the Straight Cliffs/Tropic Shale is at or near the surface (Tilton 2001). Furthermore, blasting activities on the tract can initiate landslides in this area of the tract. Therefore, landslide hazards exist under the Proposed Action for structures that are built on or next to landslide deposits.

4.6.3.3 IMPACTS TO MINERAL RESOURCES

4.6.3.3.1 Leasable Minerals

4.6.3.3.1.1 Coal

The direct impact of the Proposed Action would be the production of up to approximately 44.9 million tons of recoverable coal from federal mineral reserves in the Alton Coal Tract over the 25-year life of the mine (2 million TPY of coal removal). This would represent the removal of approximately 4% of the total estimated recoverable coal reserves (1 billion tons) in the Alton Coal Field. Impacts to coal reserves would be permanent and adverse because coal resources extracted from the tract cannot be replaced, and extraction would result in a permanent depletion from the total coal reserve in the Alton Coal Field.

4.6.3.3.1.2 Oil and Gas

Under the Proposed Action, the primary impact on oil and gas resources would be their temporary unavailability for extraction due to coal mining (unless directionally drilled from beyond active coal-mining areas). If oil and gas resources are currently present in geologic formations beneath the tract (well below the Smirl Coal Zone that would be mined), they would remain in these formations for the life of the mine or longer under the Proposed Action.

Although coal-mining operations on the tract under the Proposed Action would not result in releases of oil and gas reserves, operations would cause the direct release of CH4 located in air pockets of the coal reserves (referred to as coalbed CH_4). This CH_4 is not currently considered recoverable; therefore, there would be no impact to commercial coalbed CH_4 based on its current market conditions. However, a long-term adverse impact to this resource would result because, once released, coalbed CH_4 contained in the Smirl Coal Zone cannot be restored, and any potential for recovery would be lost.

4.6.3.3.2 Salable Minerals

4.6.3.3.2.1 Burnt Shale

Because most of the burnt shale deposits in the tract have been or would be mined by the time a decision is made by the BLM on this EIS, direct impacts to burnt shale resources are unlikely. However, if mining operations expose burnt shale in the tract, they would likely be lost as economically recoverable resources due to mixing with other overburden during reclamation. If segregated from other overburden sufficiently, they may remain usable.

Although most of the salable burnt shale deposits have been previously mined, there are other known, unmined deposits west of the tract. The BLM may need to resolve any conflicts that could arise if there is interest in this deposit in the future (such as the proposed access route to the site) that could interfere with burnt shale mining operations. Thus, the only impacts to burnt shale deposits beyond the tract would be more difficult access; the actual resource would not be adversely impacted or removed. Impacts to access and local economies are discussed in Section 3.8, Land Use and Access, and Section 3.12, Socioeconomics.

4.6.3.3.2.2 Gravel

Salable pediment gravels in the tract would be directly impacted under the Proposed Action due to mixing with other overburden following surface mining. It is not known how many areas of salable gravel are present in the tract; therefore, impacts to gravel are assumed to correspond to the total acreage that would be surface mined and uniformly spread over the entire area.

4.6.3.3.3 Locatable Minerals

4.6.3.3.3.1 Septarian Nodules

It is not known how common septarian nodules are in the tract, or if they are present in sufficient density to be economically viable for development. However, any nodules present at or near the surface in areas that would be surface mined would be at risk of burial during reclamation, and therefore may be less accessible for development. The nodules would not be removed and would therefore still be available as a resource, but their development would likely be less economically viable and their concentration in any area would likely be reduced.

4.6.3.4 UNDERGROUND COAL FIRES

The likelihood of spontaneous combustion and underground fires on the tract was assessed by the BLM Utah State Office in November 2010 using two points 1) the U.S. Bureau of Mines software program (now under the National Institute for Occupational Health and Safety [NIOSH]) and 2) historical data and coal history of the tract. This technical summary can be found in *Alton LBA EIS – Coal Spontaneous Combustion* (McKenzie 2014), which is part of the administrative record for this EIS.

Multiple runs of the NIOSH software resulted in a spontaneous combustion rating of “high” for the Smirl Coal Zone (the seam proposed for mining under all action alternatives). This indicates that the coal is highly susceptible to spontaneous combustion and rapid oxidation leading to smoke or open flames. However, historical reviews of the coal history prepared by Doelling and Graham (1972) and site visits have not shown any indication of past coal mine fires near the tract. In addition, past mining of the Smirl Coal Zone in and near the tract has occurred at very shallow depths with more exposure of the coal to atmospheric oxygen. These shallow mines have a higher potential for spontaneous combustion than the deeper underground mining that would occur under all action alternatives. The lack of evidence of fires at this site suggests that the risk is lower for the Alton Coal Tract than shown in the NIOSH results (McKenzie 2010).

The BLM-required R2P2 would address the following:

- The monitoring and prompt control of any coal fires in surface coal pits, spoil piles, and surface coal stockpiles.
- Standard and, as necessary, enhanced monitoring of underground mine conditions to provide warning of possible mine fires (for both mine safety and environmental considerations).
- The design of underground workings to provide necessary, minimum overburden cover prior to commencing full extraction mining techniques and to ensure first mining efforts do not lead to introduction of atmospheric oxygen along fractures and/or bedding planes unless the actual conditions show the coals are stable.

The risk of underground coal fires as a result of spontaneous combustion would be the same under Alternatives C and K1.

The potential impacts from underground coal fires would include the destruction of the affected areas; ignition of grass, brush, or forest fires; surface subsidence; and emission of toxic gases, such as CO, SO_2, and CH_4.

4.6.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Impacts to geology (topography, physiography, and stratigraphy), impacts related to geologic hazards, and impacts to mineral resources would be the same in nature under Alternative C, the Proposed Action, and Alternative K1. Impacts would vary between Alternative C, the Proposed Action, and Alternative K1 in terms of the total amount of coal mined, the total amount of disturbed acres, and the life of the mine. The key differences between Alternative C, the Proposed Action, Alternative K1, and the No Action Alternative are shown in Table 4.6.2.

Under Alternative C, the BLM would hold a competitive lease sale for 38 million tons of federal, recoverable coal reserves (approximately 4% of the estimated one billion tons of recoverable coal reserves present in the Alton Coal Field, and 15% less than under the Proposed Action) in a modified tract; the tract would exclude Block NW under the Proposed Action. Mining operations under Alternative C would result in approximately 1,454 acres of disturbance from surface mining (14% less than under the Proposed Action), approximately 36 acres of disturbance for centralized facilities (the same as under the Proposed Action), approximately 135 acres of disturbance for dispersed facilities (16% less than under the Proposed Action), approximately 36 acres of disturbance for relocation of KFO Route 116 (24% less than under the Proposed Action), and approximately 779 acres (including the 613 acres in the tract) of surface disturbance from underground mining operations (the same as under the Proposed Action). The life of the mine under Alternative C would be approximately 21 years, or 16% less than under the Proposed Action. The no-coal zone under Alternative C would be approximately 1,034 acres. The suite of impacts associated with Alternative C would be smaller than that of the Proposed Action because the total acreage of the tract would be smaller.

4.6.5 Alternative K1: Reduced Tract Acreage

Impacts to geology (topography, physiography, and stratigraphy), impacts related to geologic hazards, and impacts to mineral resources would be the same in nature under Alternative K1, Alternative C, and the Proposed Action. Impacts would vary between Alternative K1, Alternative C, and the Proposed Action in terms of the total amount of coal mined, the total amount of disturbed acres, and the life of the mine. The key differences between Alternative K1, Alternative C, the Proposed Action, and the No Action Alternative are shown in Table 4.6.2.

Under Alternative K1, the BLM would hold a competitive lease sale for 30 million tons of federal, recoverable coal reserves (approximately 3% of the estimated 1 billion tons of recoverable coal reserves present in the Alton Coal Field, and 33% less than under the Proposed Action and 21% less than under Alternative C) in a modified tract; the tract would exclude Block NW and Block S under Alternative K1. Mining operations under Alternative K1 would result in approximately 869 acres of disturbance from surface mining (50% less than under the Proposed Action and 40% less than under Alternative C), approximately 92 acres of disturbance for dispersed facilities (43% less than under the Proposed Action and 32% less than under Alternative C), approximately 16 acres of disturbance for relocation of KFO Route 116 (54% less than under Alternative C and 65% less than under the Proposed Action), and approximately 779 acres (including the 613 acres in the tract) of surface disturbance from underground mining operations. The life of the mine under Alternative K1 would be approximately 16 years, or 36% less than under the Proposed Action and 24% less than under Alternative C. The no-coal zone under Alternative K1 would be approximately 581 acres. The suite of impacts associated with Alternative K1 would be smaller than that of the Proposed Action and Alternative C because the total acreage of the tract would be smaller.

4.6.6 Potential Mitigation Measures

The following mitigation measures could be used to reduce geologic hazards or impacts to geology and minerals associated with the implementation of the Proposed Action or Alternative C.

- Consider the mine and reclamation plan sediment pond location in relation to geologic hazards to reduce the risk of failure in the event of a seismic event. This is addressed as part of the mine plan approval and mine permitting processes.
- As required for the mine plan and the mine permitting and bonding, develop a regularly scheduled subsidence survey.
- Segregate the deposits if mining operations expose economic burnt shale.
- Segregate the deposits if mining operations expose economic gravel.

4.6.7 Unavoidable Adverse Impacts

There would be no unavoidable adverse impacts under the No Action Alternative. Under the action alternatives, the following adverse impacts would be unavoidable (i.e., they could not be mitigated):

- Mining operations would unavoidably remove between 42.3 and 44.9 million tons of coal from the tract. This coal would not be replaceable and mining operations would result in a permanent depletion of the coal reserves in the tract.
- The topography, physiography, and stratigraphy of the tract would be permanently altered after mining operations ceased and reclamation was complete.
- If and where full extraction mining is used, subsidence due to underground mining would adversely impact the topography of the area; it would not be possible to resupport subsided areas. Impacts to stratigraphy as a function of underground mining would also be unavoidable due to removal of the coal seam and the lowering of subsided rock layers compared to surrounding rock layers.
- Coalbed CH_4 contained in the Smirl Coal Zone would be released.

4.6.8 Short-term Uses versus Long-term Productivity

In the short term, the removal of between 30.0 and 44.9 million tons of recoverable coal would eliminate the future production of the Alton Coal Tract in this specific area. A defining characteristic of nonrenewable resources such as coal is that their use in the near-term eliminates their future use. However, the short-term use of the coal in the tract would not impact the long-term productivity of the remaining coal present in the Alton Coal Field.

4.6.9 Irreversible and Irretrievable Commitments of Resources

There would be no irretrievable impacts to geology and mineral resources under the Proposed Action, Alternative C, or Alternative K1. However, the following commitments of geological and mineral resources would be irreversible and could not be recovered under the action alternatives:

- The topography, physiography, and stratigraphy of the tract would be permanently altered after mining operations ceased and reclamation was complete.
- If and where full extraction mining is used, subsidence due to underground mining would adversely impact the topography of the area; it would not be possible to resupport subsided areas.
- Impacts to stratigraphy from underground mining would also be irreversible due to production of the coal seam (a layer making up the stratigraphy of the area) and the lowering of subsided rock layers compared to surrounding rock layers.
- If mining operations expose burnt shale in the tract, these resources would likely be lost as economically recoverable resources due to mixing with other overburden during reclamation. If segregated from other overburden sufficiently, they may remain usable but may be reduced in value.
- Once released, coalbed CH_4 reserves contained in the Smirl Coal Zone cannot be regained.
- The production of up to approximately 30, 38, or 44.9 million tons of recoverable coal from federal mineral reserves in the Alton Coal Tract over the 16-, 21-, or 25-year life of the mine would be permanent and adverse because coal resources extracted from the tract cannot be replaced once mined, and extraction would result in a permanent depletion from the total coal reserve in the Alton Coal Field.
- Without potential mitigation, pediment gravels, derived mostly from the erosion of the Tropic Shale, would be irreversibly mixed with other overburden following surface mining.

4.7 Hazardous Materials and Hazardous and Solid Waste

Under the action alternatives, sources of hazardous materials on the Alton Coal Tract would include liquid wastes, fuels such as diesel fuel and gasoline (potentially containing benzene, toluene, xylene, methyl tert-butyl, ether, and tetraethyl lead), coolants, antifreezes, lubricants such as motor oil and grease (potentially containing complex hydrocarbons and lithium compounds), paints, solvents, and solid wastes. Nonhazardous solid wastes would include floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. Solid wastes would include human waste from portable toilets and waste pumped from permanent toilets with sealed containment tanks.

Hazardous and solid materials and their related impacts are assessed using the number of vehicles in use at the site, the number of vehicles refueling, and the number of vehicles transporting hazardous materials to and from the site. Impacts under the action alternatives would be minimal because solid and hazardous wastes would be controlled through SOP. In addition, management of hazardous materials, substances, and waste, in addition to nonhazardous solid waste practices (including storage, transportation, and spills) would be conducted on the tract according to the procedures listed in Section 2.3.2.7 and in compliance with 29 CFR 1910, 49 CFR 100–185, 40 CFR 100–400, Comprehensive Environmental Response, Compensation, and Liability Act, Resource Conservation and Recovery Act, Superfund Amendments and Reauthorization Act, Toxic Substances Control Act, CWA, and other federal and state regulations and policies regarding hazardous materials management and solid waste management. Public land sites contaminated with hazardous and/or solid wastes would be reported, secured, and remediated according to applicable federal and state regulations and contingency plans (BLM 2008b).

4.7.1 Regulatory Framework

Minimizing the risks associated with hazardous materials is required by federal law (see Section 2.3.2.7 and Table 2.6.1). The measures listed below would be common to both action alternatives and are also discussed in Chapter 2. The minimization of risks would require the application of safety precautions during their transport, use, storage, and disposal. As required by law, the following precautions would be implemented as mitigation and prevention of hazardous materials and liquids spills or leakages.

- Used oil would be contained and recycled according to Utah Department of Environmental Quality Solid and Hazardous Waste Division guidelines.
- Solid waste and sewage within permit boundaries would be disposed of according to approved plans.
- All production, use, storage, transport, and disposal of hazardous waste would be in accordance with applicable existing or hereafter promulgated federal, state, and government requirements.
- Emergency reporting requirements for releases of hazardous materials, as established in Comprehensive Environmental Response, Compensation, and Liability Act, as amended, would be complied with.
- Files containing MSDS for all chemicals, compounds, and/or substances used during the course of mining would be maintained.

The lessee would be expected to prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans and/or policies would include the following:

- Spill prevention control and countermeasure plans
- Spill response plans
- Inventories of hazardous chemical categories pursuant to Section 312 of the Superfund Amendments and Reauthorization Act, as amended
- Emergency response plans

4.7.2 Alternative A: No Action

Under the No Action Alternative, ACD's application to lease the coal included in the tract would not be approved, the tract would not be offered for competitive lease sale, and the coal included in the tract would not be mined.

No coal mining activities or infrastructure development would occur on the tract under the No Action Alternative, and therefore there would be no transportation, use, production, or risk of hazardous materials or hazardous and solid waste spills or leaks as a function of mining. Under the No Action Alternative, lands in the tract would continue to be managed in accordance with the KFO RMP. Land management in the tract currently includes livestock grazing, recreation (primarily OHV use and hunting), and vegetation treatments. These current uses could result in the introduction of fuel and lubricants to the tract. However, quantities would be minimal, largely resulting from minimal, dispersed use of the area by motorized recreationists and livestock grazing permittees accessing allotments by vehicle (generally truck or OHV).

4.7.3 Alternative B: Proposed Action

Mining activities under the Proposed Action would take place over approximately 25 years. Centralized facilities would occupy approximately 36 acres of land under this alternative. Another 160 acres would be used for construction of dispersed facilities, leading to 196 acres of constructed facilities. Under the Proposed Action, these acres would be subject to hazardous materials exposure for 25 years. However, adherence to SOPs and legal requirements would minimize or eliminate risks of hazardous material spills and contamination.

Under the Proposed Action, an estimated 153 coal haul vehicle round-trips per day would occur on the reasonably foreseeable coal haul transportation route. In addition, service vehicle visits to the tract would supply the mine with diesel fuel, machine equipment, office supplies, and other necessary materials. Service vehicle visits would also remove solid waste from dumpsters, remove other nonsolid wastes (such as used motor oil), and would service portable toilets and permanent toilet sealed containment tanks. This increased movement to and from the tract by service vehicles and coal haul trucks has the potential to increase the risk of fuel leakage or solid waste spills in the tract and adjacent transportation corridors. Risks of fuel leakage and spills are associated with coal truck accidents, transportation during service, refueling of vehicles, and the maintenance of vehicles used on-site. Transportation during service operations on the tract would include delivery of diesel fuel and machine and equipment parts (daily or weekly), servicing of portable toilets (weekly or biweekly), servicing of permanent toilet facilities (monthly or bimonthly), and removal of waste oil (weekly or biweekly), as necessary. Maintenance and major oil changes for most moveable equipment would take place inside the maintenance shop, and used oil would be contained and disposed of or recycled in accordance with Utah Department of Environmental Quality Solid and Hazardous Waste Division guidelines. Accidental or inadvertent leakages from storage tanks would also be possible.

If they are not contained and quickly cleaned up, leaks or spills of hazardous materials from the aforementioned activities would impact vegetation and wildlife by killing individuals and/or poisoning habitat resources or prey. Spills would also contaminate soil and water resources. Spilled fuel or other hazardous waste or materials could be transported through soils or water to aquifers or to surface waters in or outside of the tract, increasing the potential for both short-term and long-term adverse effects on vegetation, terrestrial and aquatic wildlife, and habitat quality in the tract.

4.7.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Impacts would be the same as those described under the Proposed Action with the following exceptions. Under Alternative C, the tract would be modified to exclude Block NW (see Map 2.2). The acreage of dispersed facilities constructed would be fewer than under the Proposed Action, and therefore the associated risks, such as fuel leakage and storage tank leakage, would be smaller under this alternative.

Mining activities under this alternative would take place over approximately 21 years, which is three years shorter than under the Proposed Action. Centralized facilities would occupy approximately 36 acres of land under this alternative. Another 135 acres would be used for construction of dispersed facilities, leading to 170 acres of constructed facilities. Under Alternative C, adherence to SOPs and legal requirements would minimize or eliminate risks of hazardous material spills and contamination.

4.7.5 Alternative K1: Reduced Tract Acreage

Impacts under Alternative K1 would be the same as those described under the Proposed Action and Alternative C with the following exceptions presented here. Under Alternative K1, the tract would be modified to exclude Block NW and Block S (see Map 2.3). The acreage of dispersed facilities constructed would be fewer than under the Proposed Action and Alternative C, and therefore the associated risks, such as fuel leakage and storage tank leakage, would be smaller under this alternative.

Mining activities under this alternative would take place over approximately 16 years, which is nine years shorter than under the Proposed Action and five years shorter than under Alternative C. Centralized facilities would occupy approximately 36 acres of land under this alternative. Another 92 acres would be used for construction of dispersed facilities, leading to 128 acres of constructed facilities. Under Alternative K1, adherence to SOPs and legal requirements would minimize or eliminate risks of hazardous material spills and contamination.

4.7.6 Potential Mitigation Measures

No potential mitigation measures, beyond legal and regulatory requirements, have been identified for hazardous materials and hazardous and solid waste.

4.7.7 Unavoidable Adverse Impacts

No unavoidable adverse impacts would occur because SOPs and mitigation measures would be followed.

4.7.8 Short-term Uses versus Long-term Productivity

No further risk of hazardous materials or liquid spills or leakages would exist at the close of mining operations, and therefore no long-term adverse effects on productivity of the site are anticipated.

4.7.9 Irreversible and Irretrievable Commitments of Resources

There would be no irreversible or irretrievable commitments of resources with respect to hazardous materials and hazardous and solid waste associated with mining.

4.8 Land Use and Access

4.8.1 Land Use and Ownership

Primary land uses in and adjacent to the Alton Coal Tract include tourism, farming, livestock grazing, and dispersed recreation including hunting. In addition, Alton Coal operates the Coal Hollow Mine east of Block S.

Impacts to land use and access were analyzed by determining which existing land uses would conflict with proposed mining activities. Land uses would be affected because public access would be eliminated during the life of the mine to ensure public safety. Land use would also be restricted during the post-mining reclamation period (10 or more years) to assist in the establishment of suitable vegetation. Disturbance from mine-related activities would include pit disturbance, grading for the construction and maintenance of centralized and dispersed facilities, and the relocation of KFO Route 116. Impacts from these activities are grouped together because the impacts to land use would result from a combination of all mine-related activities, and not specific aspects of each activity. Grazing and recreational activities in the tract would be prohibited from active mine areas for the life of the mine and the 10-year reclamation period. Tourism (sightseeing) would not be prohibited or restricted by mining activities because access to other federal lands in the area would still be available.

4.8.2 Regulatory Framework

FLPMA of 1976 ensures that public lands are managed for multiple uses to best meet the present and future needs of the public. The KFO RMP identifies management direction for land uses in the area in the form of goals and objectives; “Make public lands available for ROWs, permits, and leases. The suitability for these land actions would be judged on a case-by-case basis.” (BLM 2008b:2–44)

Although private lands in the tract are zoned for agriculture under the *Kane County, Utah General Plan* (FCAOG 2011), uses are regulated by land use ordinances and the general plan is used as an advisory guide for land use decisions. A zone change would be required before any mining takes place, as required by the Kane County Commission and Planning Commission (Kane County 2012).

Under both action alternatives, BLM-administered lands in the tract would be reclaimed and suitably restored for historic uses such as livestock grazing, wildlife habitat, and recreation. Private lands would be reclaimed and suitably restored to allow existing land uses to be resumed following mining. Post-mining land uses may differ from those presented here; however, their approval would require a process and approval by DOGM.

4.8.3 Alternative A: No Action

Under the No Action Alternative, land use, ownership, and prior rights to the tract would remain unchanged. The tract would not be mined and activities in the area would continue under their current condition. Dominant activities such as grazing, recreation, and vegetation treatments in the area would not be impacted as a function of mining on the tract.

4.8.4 Alternative B: Proposed Action

Under the Proposed Action, 1,993 acres of surface disturbance would occur on the 3,576-acre tract that encompasses federal and private lands (Table 4.8.1). Because the area is of mixed uses, some of the acres of impacts overlap.

Surface-mining activities would results in short-term impacts under the Proposed Action; livestock grazing would be restricted, wildlife habitat would be reduced, and public access and associate recreational use would be restricted. During the life of the mine, adjacent federal lands would support livestock grazing and recreation (e.g., hunting and OHV use).

There would be no long-term impacts under the Proposed Action; surface and vegetation in the tract would be reclaimed, and the land would be returned to a condition similar to its original status. The land would reopen to grazing, hunting, and other recreational opportunities that existed before the mine.

Table 4.8.1 shows the dominant land uses in the tract and the impacts that would occur from mining activities under the Proposed Action.

Table 4.8.1. Land Uses Impacted in the Alton Coal Tract under the Proposed Action

Affected Land Use	Type of Use	Impact
Grazing	Livestock, mainly cattle, for grazing and forage.	Loss of or unavailable access to approximately 92 AUMs annually (3,220 AUMs over the life of the mine and the 10-year reclamation period), due to mining activities (see Section 4.9 for additional information).
Agriculture	Farming	Loss of acres available for agriculture during the active mining period.
Recreation	Hunting and OHV use, common in and adjacent to the tract.	Unavailable access to lands for recreational use (throughout the life of the mine). Impacts to recreation experience by increased traffic, noise, and dust (see Section 4.11 for additional information).
Tourism	Visits to nearby park areas such as Bryce Canyon National Park, Grand Staircase-Escalante National Monument, and two scenic highways.	Negligible impacts to tourism from mining activities (see Section 4.12 for additional information).

4.8.4.1 FEDERAL LANDS

Under the Proposed Action, the primary use of federal lands would be coal extraction. Coal mining would preclude other possible uses of the land, making them unavailable during the life of the mine. Approximately 2,280 surface acres (64%) of the tract that would be unavailable for other uses under the Proposed Action are federally owned. Surface-disturbing activities to these lands would include the removal of vegetation, which would result in

- impacts to agriculture by removing acres available for crops,
- impacts to grazing by decreasing AUMs available for forage, and
- impacts to recreation from increased traffic, noise, and dust, diminishing the experience and opportunities available.

Although mining activities may result in changes noticeable to those visiting the nearby Dixie National Forest, Bryce Canyon National Park, and Grand Staircase-Escalante National Monument, it is not anticipated that the increased traffic, noise, and dust resulting from the mine would decrease the overall experience of visitors enough to affect visitation to these areas. Two-track roads also exist throughout the tract for OHV use and hunting access.

4.8.4.2 PRIVATE LANDS

All coal reserves in the tract are federally owned, though surface ownership is mixed, and mine activity would result in surface disturbance to private lands. Approximately 1,296 surface acres (36%) of the tract under the Proposed Action are privately owned, consisting of eight different private surface owners. Surface owners who are legally qualified to give consent to mine federal minerals under the private surface owner's estate would be determined should a decision to lease be made. Prior to any mining activity moving forward, the BLM would require written consent from the qualified surface owner. The BLM would not be involved in the content of the agreement. Private land uses in the tract and surrounding land include agriculture, domestic grazing, and dispersed recreation. Two-track roads also exist throughout the tract for private landowner access to private surface lands.

Impacts from surface disturbance on private lands would be the same as those described under federal lands. Impacts to counties from mining activity would be the temporary loss of lands that are zoned for activities such as agriculture, grazing, and recreation. Lands available for these uses would be removed for 25 years while mining activities took place; however, they would be available for use during the 10-year post-mining reclamation period. These activities are in compliance with the *Kane County, Utah General Plan*, which allows lands to be open for mineral exploration and development (FCAOG 2011). Additionally, the Alton town cemetery is 780 feet from the tract boundary. At this distance, it is not anticipated that any impacts would occur to the cemetery from mining activities.

4.8.5 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Impacts to land use under Alternative C would be similar to those described under the Proposed Action, but to a slightly lesser degree. The nature of activities would be the same under both alternatives; however, Alternative C would propose to mine 403 fewer acres (removal of Block NW) of private lands than Proposed Action. Additionally, the life of the mine would be 21 years plus the 10-year reclamation period (31 years).

The shorter timeframe would result in a loss of 2,852 AUMs, which is 368 fewer than under the Proposed Action over the life of the mine and reclamation period. Additionally, the Alton town cemetery would be located 6,380 feet from tract boundary, which would create less of an impact than under the Proposed Action.

4.8.6 Alternative K1: Reduced Tract Acreage

One of the intents of including Alternative K1 was to resolve issues related to land uses. Although the types of impacts to land use and access under Alternative K1 would be similar to those described under the Proposed Action, they would occur to a lesser degree. The nature of activities would be the same under both alternatives; however, under Alternative K1, 1,462 fewer acres are being considered for leasing (removal of Block NW and removal of Block S) than under the Proposed Action. These acres include 880 acres of private surface estate lands. Alternative K1 would result in a loss of 2,392 AUMs, which is 828 less than the Proposed Action and 460 less than Alternative C. Additionally, based on the reduction in available coal under Alternative K1, the life of the mine would be 16 years; nine fewer years than under the Proposed Action.

On the 880 acres of private surface estate that is excluded under Alternative K1, no surface use agreement with those qualified surface owners would be necessary should the decision to lease be made. The current private land uses in Block NW and Block S would continue undisrupted.

4.8.7 Potential Mitigation Measures

No potential mitigation measures are proposed to address land use conflicts resulting from mining activities.

4.8.8 Unavoidable Adverse Impacts

Unavoidable adverse impacts would include the loss of use and access to the tract for described land uses during the life of the mine. After mitigation, the described land uses would be lost until reclamation is complete.

4.8.9 Short-term Uses versus Long-term Productivity

It is not anticipated that the short-term use of the area for mining would adversely affect the long-term productivity of land uses. Mining activities would temporarily make the area unavailable for the existing land uses and access for agriculture, grazing, and recreation; however, in the long term, the area would be reclaimed to its approximate original condition, and uses would resume as they had previously existed.

4.8.10 Irreversible and Irretrievable Commitments of Resources

The removal of coal from the tract would be an irreversible commitment of resources because this coal cannot be regenerated. Measures would be implemented to return the area to its approximate pre-mining condition following coal mining, making the loss of opportunities for other land uses irretrievable, but not irreversible. The land status and prior rights to the land would remain unchanged during the life of the mine.

4.9 Livestock Grazing

Impacts to livestock grazing were analyzed by determining how proposed mining activities would conflict with existing grazing activities. Grazing and access would be eliminated during the active mining period to ensure public safety. It would also be restricted during post-mining reclamation to assist in establishing suitable vegetation. Because access to the tract would be restricted, the livestock grazing analysis area consists of all acres of allotments on the tract; impacts were not analyzed by specific acres of vegetation removed (these impacts are discussed in Section 4.15, Vegetation). Disturbance from mine-related activities would include pit disturbance, grading for the construction and maintenance of centralized and dispersed facilities, and the relocation of KFO Route 116. Impacts from these activities are grouped together because the impacts to land use would result from a combination of all mine-related activities, and not specific aspects of each activity.

4.9.1 Regulatory Framework

FLPMA of 1976 ensures that public lands are managed for multiple uses, including livestock grazing, to best meet the present and future needs of the public. The KFO RMP includes standards and guidelines for grazing management. These standards and guidelines provide management direction and the necessary regulatory framework for livestock grazing. Alternatively, they can be found on the Utah BLM website (BLM 2008b). If changes to public land use restrict livestock grazing, 43 CFR 4110.4-2 requires that permittees be notified two years in advance and receive compensation for authorized permanent range improvements.

4.9.2 Alternative A: No Action

Under the No Action Alternative, ACD's application to lease the coal in the Alton Coal Tract would not be approved, the tract would not be offered for competitive lease sale, and the coal included in the tract would not be mined. Therefore, under the No Action Alternative, there would be no impacts to livestock grazing as a function of coal mining; vegetation would be unaffected by mining, and grazing practices would remain unchanged. Grazing activities would continue to be managed as described in the KFO RMP (BLM 2008b). Impacts to livestock grazing from other land uses such as recreation and vegetation treatments would continue similar to current conditions.

4.9.3 Alternative B: Proposed Action

Mine-related surface activities on the tract would consist of land clearing, the construction of dispersed facilities, and the relocation of KFO Route 116. These would result in a long-term loss of vegetation access because livestock would be restricted to areas without mining activity throughout the life of the mine (25 years) and during the 10-year (or more) reclamation period. For purposes of analysis, it is assumed that grazing in the tract would be unavailable for 35 years; therefore, the allotments in the tract would be considered nonuse. Therefore, even in areas in the tract that would not be disturbed for mine-related activities, it is assumed that the use of available AUMs, existing water sources, and livestock facilities would be lost for the life of the mine and reclamation period. This approach provides the most conservative estimate of livestock grazing impacts for phased mining operations given that specific locations and timing of mining and reclamation activities are not available at this time.

Table 4.9.1 illustrates the total acres of disturbance and the percentage of allotments that would be affected by all alternatives, including the Proposed Action.

Table 4.9.1. Acres of Vegetation Impacted by Mining Activities, by Alternative

	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)	Alternative K1 (Reduced Tract Acreage)
Acres of vegetation disturbance	0	1,975	1,650	1,005
Percentage of total allotments*	0%	24%	20%	12%

*The total federal acreages of allotments is 8,222.

Assuming that that the annual disturbance would remain the same throughout the life of the mine, the Proposed Action would result in the loss of or restricted access to 1,975 acres of vegetation. This represents 24% of the total acres in all seven allotments (see Table 4.9.1).

Total acres of allotments are used to calculate the number of AUMs using the number of AUMs allocated and the percentage of AUMs that lie in the tract. To determine overall impacts to forage available for grazing (AUMs) from the Proposed Action, the number of AUMs impacted is compared to the total number of AUMs available in each of the allotments. Table 4.9.2 shows the number of AUMs that would be lost per grazing allotment from restricted access, as well as the overall percentage that those AUMs represent for the entire allotment.

Table 4.9.2. Allotment Acreages and Animal Unit Months in Alton Coal Tract

Allotment	Season of Use	Number of Permittees	Total AUMs Allocated to Livestock Annually	Percentage of Allotment in the Tract	Calculated AUMs in the Tract	AUMS Allocated to Livestock over the Life of the Mine and the Reclamation Period			AUMS lost over the Life of the Mine and the Reclamation Period		
						Alt. B (35 years)	Alt. C (31 years)	Alt. K1 (26 years)	Alt. B (35 years)	Alt. C (31 years)	Alt. K1 (26 years)
Alton	6/1/2013–10/31/2013	1	5	99%	5	175	155	130	175	155	130
Cove (Alton)	6/1/2013–10/31/2013	1	10	99%	10	350	310	260	350	310	260
Isolated Tracts	5/16/2013–10/31/2013	1	67	24%	16	2,345	2,077	1,742	560	496	416
Levanger Lakes	6/1/2013–11/15/2013	1	33	23%	8	1,155	1,023	858	280	248	208
Robinson Creek	6/1/2013–11/30/2013	1	24	40%	10	840	744	624	350	310	260
Syler Knoll	5/1/2013–10/31/2013	1	6	82%	5	210	186	156	175	155	130
Upper Sink Valley	6/1/2013–10/15/2013	1	311	12%	38	10,885	9,641	8,086	1,330	1,178	988
Total		**7**	**456**	**26%**	**92**	**15,960**	**14,136**	**11,856**	**3,220**	**2,852**	**2,392**

The Proposed Action would restrict or prohibit access to approximately 92 AUMs annually for seven permittees (see Table 4.9.2). Assuming that permits and seasons of use would remain the same over the life of the mine, approximately 3,220 AUMs would be lost over 35 years. The Proposed Action would have greater impacts to grazing than Alternative C, Alternative K1, and the No Action Alternative. During mine-related activities, the direct loss of livestock from vehicle collisions along transportation routes would be uncommon.

There is also a potential for livestock grazing to be affected along the approximately 110-mile reasonably foreseeable coal haul transportation route. Road dust, coal dust, and exhaust from coal hauling would add to the road dust and exhaust from existing traffic along the reasonably foreseeable coal haul transportation route. It is assumed that the effects from this road dust, coal dust, and exhaust would occur within a 100-foot buffer around the reasonably foreseeable coal haul transportation route. The deposition of road dust, coal dust, and vehicle exhaust can affect the overall health of vegetation used as forage for livestock within this buffer by inhibiting stomatal function and photosynthesis. However, it is assumed that all coal trucks would be covered or otherwise contained, preventing coal dust from escaping. There is also a risk of spills along the reasonably foreseeable coal haul transportation route from potential coal truck accidents, which also presents a risk to vegetation used as forage for livestock along the route.

Under the Proposed Action, and all other action alternatives, Block Sa (186.2 acres) would not be mined and the lessee would apply pre-mining vegetation treatments to the block. These proposed vegetation treatments would improve the health, vigor, recruitment, and production of perennial grasses, forbs, and shrubs and provide a more palatable and nutritional source of forage for both livestock and wildlife, as well as protect the soil resource and other associated watershed values.

4.9.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Impacts under Alternative C would be the same in nature to those under the Proposed Action because the activities would be the same in nature; however, the number of AUMs affected by Alternative C would be less than the Proposed Action. Alternative C would cause 1,650 acres of vegetation disturbance, compared to 1,975 acres of vegetation disturbance under the Proposed Action and 1,005 acres under Alternative K1. Under Alternative C, there would be a loss of 2,852 AUMs, compared to a loss of 3,220 AUMs under the Proposed Action and 2,392 AUMs under Alternative K1. Alternative C would therefore affect 368 fewer AUMs and 300 fewer acres of vegetation over the life of the mine and reclamation period than the Proposed Action. The impacts from Alternative C would have greater impacts to grazing than Alternative K1, affecting 645 more acres of vegetation and 460 more AUMs. Alternative C would also have greater impacts to grazing than the No Action Alternative, which would not impact vegetation or AUMs. Access under Alternative C would be restricted for 31 years (21-year mine life plus 10-year reclamation period) instead of the 35 years under the Proposed Action and 26 years under Alternative K1.

4.9.5 Alternative K1: Reduced Tract Acreage

Impacts under Alternative K1 would be the same in nature to those under the Proposed Action and Alternative C because the activities would be the same in nature; however, the acres of vegetation and number of AUMs affected by Alternative K1 would be less than the Proposed Action and Alternative C. Alternative K1 would cause 1,005 acres of vegetation disturbance, compared to 1,975 acres of vegetation disturbance under the Proposed Action and 1,650 acres under Alternative C. Under Alternative K1, there would be a loss of 2,392 AUMs, compared to a loss of 3,220 AUMs under the Proposed Action and 2,852 AUMs under Alternative C. Alternative K1 would therefore impact 828 fewer AUMs and 970 fewer acres of vegetation over the life of the mine and reclamation period than under the Proposed Action. Alternative K1 would also affect 460 fewer AUMs and 645 fewer acres of vegetation than Alternative C. Alternative

K1 would have greater impacts than the No Action Alternative, which would not impact vegetation or AUMs. Access under Alternative K1 would be restricted for 26 years (16-year mine life plus 10-year reclamation period) instead of the 35 years under the Proposed Action and 31 years under Alternative C.

4.9.6 Potential Mitigation Measures

Although no specific mitigation measures have been proposed for livestock, measures committed for vegetation reclamation would benefit livestock through either preservation or reclamation of forage. Reclamation measures proposed for vegetation that would benefit livestock consist of

- permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved reclamation seed mixtures consisting of suitable native and non-native species;
- using native shrubs for reclamation;
- prior to seeding with final seed mixture, controlling erosion on reclaimed lands using mulching, cover crops, or other approved measures;
- chemically and/or mechanically controlling weed infestation;
- selectively planting shrubs in riparian areas; and
- planting sagebrush seedlings in addition to seeding with sagebrush.

4.9.7 Unavoidable Adverse Impacts

The loss of access and land available for livestock grazing during the life of the mine would result in unavoidable adverse impacts to livestock grazing during the life of the mine and during reclamation.

4.9.8 Short-term Uses versus Long-term Productivity

Short-term uses associated with proposed mine-related activities (e.g., roads, grading, and vegetation removal) would reduce the forage productivity and available AUMs until the disturbances were successfully reclaimed. Overall, impacts to long-term productivity resulting from these activities would be minimal due to the limited overall percentages that would be impacted by both action alternatives.

4.9.9 Irreversible and Irretrievable Commitments of Resources

Assuming that the entire tract would be unavailable for access and any activities other than mining during the life of the mine, irretrievable impacts would include the loss of livestock forage and access to allotments for some 35 years until reclamation is successful. Irreversible impacts would include livestock mortality from collisions, should any occur.

4.10 Paleontology

Direct impacts to fossil resources from the Proposed Action, Alternative C, and Alternative K1 would consist of the following:

- The physical loss of the resources through physical damage, destruction, and/or through extraction, weathering, or unauthorized collection after extraction.
- The loss of important contextual data for the resources if they are excavated without documentation of their stratigraphic horizon (age) and environment of deposition (taphonomy). Their value to science and to the public would be permanently degraded.

Either outcome would significantly impact the value and state of paleontological resources in the area. For paleontological resources, all impacts would be long term because they would persist for the life of the mine and following reclamation.

4.10.1 Regulatory Framework

Certain types of regulations and other design features would be mandatory because of the significance of the fossil resource in the Alton area. Three of these measures would be employed to ensure reasonable benefit to the fossil resource.

As per FLPMA, 43 CFR, 8365.1–5, and the BLM Manual H-8270-1 (General Procedural Guidance for Paleontological Resource Management), the first measure would be to salvage significant in-situ specimens if they are discovered by mining personnel or qualified monitors during mining operations. Significant in-situ specimens are the most important specimens from both a scientific and public perspective because they have the most potential to be complete and in their original context. If potentially significant fossil remains are discovered, the mine operator (successful bidder) or qualified paleontological monitor would immediately notify the BLM-KFO paleontologist or their designated authority and protect the discovery from damage or looting, suspending all activities in the immediate vicinity of such discovery until the site can be evaluated by the BLM-KFO paleontologist or their designated authority. Next, a determination would be made as to whether the specimen is worth salvaging. Under normal circumstances, determinations would be completed within 24 hours of notification by the mine operator. If the specimen is determined to be of scientific significance and worth collecting, the BLM-KFO paleontologist, their designated authority, or a qualified paleontological consultant chosen by the mine operator would initiate scientific collection of the specimen. This would be completed within 72 hours of determination. Specimens would be housed at the Utah Museum of Natural History (UMNH) for the public benefit. Collection and curation costs of large specimens, which averaged $2,000–$5,000 in 2008 for a large specimen, would be borne by the mine operator. Costs for surface collection and curation of small specimens (1 m or less) would be borne by the BLM and the UMNH, the official BLM repository for Utah. Final determination on significance of smaller in-situ specimens would be made by the UMNH.

The second measure would be a design feature that involves monitoring both the overburden piles and pits by the BLM-KFO paleontologist or their designated authority. Any significant material found in the overburden piles would be collected with as much data as possible and reposited at the UMNH. Final determination on the significance of ex-situ specimens would also be made by the UMNH. The third measure would be a design feature that helps offset the unavoidable loss of significant resource in the course of operations (see discussion below of the monetary value of the ammonite fossils) by enhancing research and public enjoyment of similar resources off-site. A single $100,000 payment would be made by the successful bidder to support scientific research on paleontology within the KFO. This would also make the region’s fossil resources more accessible to the public through exhibits and other forms of education and outreach. The BLM would administer this fund in cooperation with the mine operator, through a third party such as a Natural History Association or other nonprofit group. Each year for the first five years of the mine's operation, calls for proposals for research and/or public outreach projects would be made, with all awards each year totaling approximately $20,000. Winning proposals from qualified scientific or public institutions would be awarded funds to complete a research or outreach project, with a report due at the end of the calendar year for research projects and an educational or exhibit product due for the outreach projects. The mine operator would be named as a partner in these projects.

4.10.2 Alternative A: No Action

Under the No Action Alternative, subsurface paleontological resources in the Alton Amphitheatre, including the Alton Coal Tract, would be unaffected by mining activities; therefore, there would be no significant impact to their condition or context. Permitted and unauthorized collections of ammonites would continue, which would result in a minor loss of fossil resources in the tract. Resources currently exposed at the surface would continue to weather and degrade over time, also causing a minor loss.

4.10.3 Alternative B: Proposed Action

Under the Proposed Action, surface-mining activities (pit disturbance) would remove approximately 1,750 acres of Tropic Shale overburden to access coal resources in the Smirl Coal Zone. This amount is equal to the amount of surface disturbance that would occur from the pits because the Tropic Shale occurs under the surface where coal is present. An additional 613 acres of coal is potentially minable through subsurface techniques, but this would directly affect only the Smirl Coal Zone and not the overlying Tropic Shale. Because mining activity would go deep into the subsurface into fresh geologic bedrock units, accurate modeling of the impact to subsurface resources is difficult.

A total of 196 acres would be disturbed for operational facilities. This would consist of centralized and dispersed facilities. Centralized facilities would be present on approximately 36 acres for the 25-year life of the mine under the Proposed Action. Dispersed facilities, which would likely shift as coal extraction activities progress, would be located on approximately 160 acres. In addition, 47 acres would be disturbed for the relocation of KFO Route 116 into the no-coal zone. Exposures of the middle member of the Dakota Formation would be affected almost entirely by road and facility construction rather than by the operations in the mine pit. The centralized facilities would be located on the higher elevations of the tract divided by Sections 24 and 19, north of Lower Robinson Creek. They would cover both the lower Tropic beds and the middle and upper portions of the Dakota Formation. Ground-disturbing activities associated with the construction of centralized facilities and the rerouting of KFO Route 116 would potentially impact vertebrates and significant invertebrates in the middle member of the Dakota Formation and the Tropic Shale. The nature of impacts to fossils in this area would be the same as described at the beginning of this section. The amount of Tropic Shale disturbance under the Proposed Action would be approximately 1,750 acres.

The most profound impacts to paleontological resources would be to fossils contained in the Smirl Coal Zone and fossils overlying the Tropic Shale overburden inside the pit disturbance areas. Quantifying the resource impacts in the Smirl Coal Zone is difficult because paleontology knowledge about the Smirl Coal Zone is limited. As stated earlier in Chapter 3's Paleontology section, the Smirl Coal Zone has the potential to preserve articulated vertebrates with soft tissue remains and delicate invertebrates such as insects (Konservat-Lagerstatte). However, such occurrences are rare in the Dakota Formation, and the presence of such resources in the pit disturbance areas associated with the Proposed Action would likely be revealed through the mining process. If such resources exist in the Dakota Formation, their importance to science and to the public cannot be overstated. They would be the only known example of a Cenomanian-age terrestrial Lagerstatte in the world, and its loss due to mining operations would be significant.

Increasing knowledge of the Tropic Shale's paleontology allows for some rough quantitative assessment and a better evaluation of impacts to fossil resources. Within 15 miles of the tract, there is 30,870 acres of Tropic Shale. A total of 1,750 acres of Tropic Shale would be disturbed in the tract under the Proposed Action. Therefore, approximately 5.7% of the Tropic Shale's paleontology within a 15-mile band would be adversely impacted over the long term.

The density of well-preserved ammonites or other invertebrate fossil material in the lower ironstone interval of the Tropic Shale is low; however, occasional pockets of significant three-dimensional specimens in concretions do occur. Up to 12 such pockets would be expected to occur in pit disturbance areas. Well-preserved ammonites from the *Vascoceras diartianum* zone are rare in the region; therefore, they are scientific significance and their loss through physical degradation and destruction would be an adverse impact. Fortunately, the concretionary horizons that contain most of the ammonites are fairly well defined. Each zone is typically distinctive enough that loss of contextual data would not be a great issue for specimens salvaged off of spoils piles.

The overlying *Euomphaloceras septemseriatum* zone contains a high density of well-preserved ammonite and other fossil material. Examining nondisturbed exposures of concretions from this zone in the Alton area, large *Metoicoceras geslinianum* and *Placenticeras cumminsi* ammonites can be encountered approximately every 10–30 feet. Using one ammonite per 1,000 square feet as an extremely conservative estimate of specimen density, 76,230 significant ammonite specimens would potentially be destroyed or damaged in the pit disturbance area during mining operations under the Proposed Action. Although these specimens have only moderate scientific value, they have great significance to amateur fossil enthusiasts who eagerly seek them out. Even though these specimens cannot be mined commercially and sold from public lands, one way to estimate the magnitude of loss to the public is to assign a conservative $50 commercial value for each individual ammonite specimen (these specimens actually sell for $100 or more when collected from private lands) as a way to calculate loss to the public. This results in the ammonites having a surprising approximately $3.8 million cash value ($50 multiplied by the estimated number of specimens of 76,230). The density of vertebrates in this interval is not as high as it is in the overlying zones; therefore, only one or two larger vertebrate sites might be damaged during the course of mining operations. However such specimens have very high scientific significance. Several dozen articulated fish might also be damaged or removed from context. Little is known about Cenomanian fish from Utah; therefore, any of these specimens would be scientifically significant. Unfortunately it would be difficult to recover contextual data (i.e., placement into stratigraphic order) for any of the vertebrates if they were collected from overburden piles, because they typically create their own concretionary halos that do not contain diagnostic invertebrates.

The remainder of the Cenomanian concretionary interval would mostly suffer loss of rare and scientifically significant ammonite specimens from the *Euomphaloceras costatum* through *Neocardioceras juddi* zones. However, in similar fashion to the *E. septemseriatum* zone, several dozen articulated fish specimens and one or two larger vertebrate skeletons might also occur in the pit disturbance areas and therefore be damaged or removed from context. The overlying lower Turonian interval (*Watinoceras coloradoense and Fagesia catinus* through *Mammites nodosoides* Ammonoid zones) is the opposite. Here, well-preserved invertebrates are not expected to be significantly impacted, but the density of larger marine vertebrate fossils is probably two or three times higher than it is in the underlying Cenomanian. As a result, four to six large vertebrate skeletons might be damaged in this interval over the life of the mine. Dozens of smaller fish skeletons could also be destroyed or salvaged out of context. Because the headwall of the mine would not exceed approximately 200 feet in height above the Smirl Coal Zone, its impacts would probably be limited to lower Turonian strata, and the *Collignoniceras woolgari* and *Prionocyclus hyatti* zones would not be affected.

When compared to the No Action Alternative, disturbance to the Smirl Coal Zone and overlying Tropic Shale overburden and estimated monetary impacts would be much greater under the Proposed Action, because the No Action Alternative proposes no disturbance to existing paleontological resources.

4.10.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Impacts would be similar to those discussed under the Proposed Action, except there would be approximately 1,454 acres of pit disturbance, 171 acres of disturbance from centralized and dispersed facility activities, and 36 acres of disturbance due to the relocation of KFO Route 116. The shorter time duration of mining activities under Alternative C (21 instead of 25 years) would not change impacts on paleontological resources because the impacts would occur from acreages disturbed regardless of the timeframe of when they occur.

The 16% smaller footprint of the mine would lower the overall impact to paleontological resources affected by pit operations. For example, the monetary value of the estimated number of ammonites damaged or destroyed would be decreased from approximately $3.8 million to approximately $3.6 million. For vertebrate resources, the estimated number of sites potentially affected by facilities construction, pit operations, and the rerouting of KFO Route 116 for Alternative C would be within the margin of error for the estimates made for the Proposed Action and would therefore be the same.

The total amount of disturbance to the 30,870-acre, 15-mile band of Tropic Shale in the area would be approximately 1,454 acres. Thus, an approximately 4.7% disturbance of the Tropic Shale's paleontology would occur under Alternative C.

When compared to the No Action Alternative, the 1,454 acres of pit disturbance, 171 acres of facilities, and 36 acres of road relocation would have a greater impact on the Smirl Coal Zone and overlying Tropic Shale overburden because 0 acres would be impacted under the No Action Alternative. The approximately $3.6 million estimated loss to the public would not occur under the No Action Alternative.

4.10.5 Alternative K1: Reduced Tract Acreage

Impacts would be similar to those discussed under the Proposed Action, except there would be approximately 869 acres of pit disturbance, 128 acres of disturbance from centralized and dispersed facility activities, and 16 acres of disturbance due to the relocation of KFO Route 116. The shorter time duration of mining activities under Alternative K1 (16 instead of 25 years) would not change impacts on paleontological resources because the impacts would occur from acreages disturbed regardless of the timeframe of when they occur.

The approximately 50% smaller footprint of the mine would lower the overall impact to paleontological resources affected by pit operations. For example, the monetary value of the estimated number of ammonites damaged or destroyed would be decreased from approximately $3.8 million to approximately $1.9 million. For vertebrate resources, the estimated number of sites potentially affected by facilities construction, pit operations, and the rerouting of KFO Route 116 for Alternative K1 would be within the margin of error for the estimates made for the Proposed Action and would therefore be the same.

The total amount of disturbance to the 30,870-acre, 15-mile band of Tropic Shale in the area would be approximately 869 acres. Thus, a 2.8% disturbance of the Tropic Shale's paleontology would occur under Alternative K1.

When compared to the No Action Alternative, the 869 acres of pit disturbance, 128 acres of facilities, and 16 acres of road relocation would have a greater impact on the Smirl Coal Zone and overlying Tropic Shale overburden because 0 acres would be impacted under the No Action Alternative. The approximately $1.9 million estimated loss to the public would not occur under the No Action Alternative.

4.10.6 Potential Mitigation Measures

No potential mitigation measures are proposed or recommended; however, certain regulations and design features would address potential impacts. These regulations and design features are discussed above in Section 4.10.1.

4.10.7 Unavoidable Adverse Impacts

The loss of a percentage of significant fossil resource or their contextual data is an unavoidable impact under both action alternatives. In many other regions of Utah, such as the Book Cliffs or Price areas, the commercially viable coal seams are not directly associated with such highly fossiliferous marine or terrestrial units, and therefore impacts to fossil resources are minimal. In the Alton area, it is anticipated that a large number of significant fossils would be destroyed or removed from context particularly in the Tropic Shale.

4.10.8 Short-term Uses versus Long-term Productivity

The short-term use of the tract for purposes of coal extraction would result in adverse impacts to the long-term productivity of paleontological resources. The coal extraction process would result in the permanent removal of fossils from the Dakota Formation and the Tropic Shale in the tract resulting in a long-term decrease in the productivity of paleontological resources in the area.

4.10.9 Irreversible and Irretrievable Commitments of Resources

All impacts to paleontological resources in the tract would be irreversible. Once disturbed and removed, fossils currently present in formations where disturbance would occur to facilitate the extraction of coal cannot be replaced or restored, or in some cases removed and preserved. They would be permanently removed.

4.11 Recreation

For all alternatives, short-term impacts to recreation resources are those impacts that would occur throughout the duration of mining operations. Long-term impacts are those impacts that would occur after mining operations and once reclamation activities are complete. With proper reclamation procedures, there would be no long-term impacts to recreation resources for all alternatives, and existing recreation opportunities would resume in areas affected either directly or indirectly by mining operations.

Impacts to recreation resources as a result of coal truck traffic on the reasonably foreseeable coal haul transportation route (see Section 2.6.4) are not discussed under the alternatives sections because based on the transportation analysis (see Section 4.14), impacts would be negligible. LOS is a measure of the quality of service on transportation infrastructure. It generally indicates the level of traffic congestion. LOS measurements vary from LOS A (the best) to LOS F (the worst); see Table 4.14.1 for a description of LOS A–F. Transportation analyses illustrate that the existing LOS on the transportation route is LOS A for most segments and intersections and LOS B and C for others. These LOS would be maintained even with the addition of coal truck traffic. Transportation analyses also project LOS on the transportation route in the year 2020. Conditions in the year 2020, with the addition of coal trucks, would result in a LOS D on SR-20 between US-89 and I-15. All other segments and intersections would be LOS A, B, or C. LOS D conditions are those that are approaching unstable flows of traffic, tolerable delays of 25–35 seconds per vehicle at unsignalized intersections, and delays of 35–55 seconds per vehicle at signalized intersections. LOS changes would be minimal with additional truck traffic added to existing traffic conditions and with additional truck traffic added to 2020 conditions; therefore, changes to time spent traveling to recreational resources, and changes to the settings, experiences, and activities of recreationists using the transportation route for sightseeing and/or to travel to and from recreation destinations, would also be minimal.

4.11.1 Regulatory Framework

Public lands in and surrounding the proposed tract are managed for dispersed recreation. The goals and objectives for recreation management, including OHV use, are discussed in the KFO RMP (BLM 2008b). Hunting regulations on the PPMA are maintained and enforced by UDWR.

4.11.2 Alternative A: No Action

Under the No Action Alternative, ACD’s application to lease the coal included in the tract under the Proposed Action or Alternative C would not be approved, the tract would not be offered for competitive lease sale, and the coal included in the tract would not be mined.

Rejection of the application would not affect permitted mining activities on private land adjacent to the tract (the Coal Hollow Mine). The Coal Hollow Mine consists of approximately 635 acres of land and approximately 5 million short tons of recoverable coal leased from private surface and mineral owners. Discussion of impacts to recreation resources from the Coal Hollow Mine is included in Section 4.19 Cumulative Impacts.

Under the No Action Alternative, recreation use—predominantly big game hunting in and near tract—would continue at present or slightly increasing levels (Aoude 2008). Hunting in the Alton CWMU would continue, and the same amount of big game permits would be issued as in years past. No acres of big game hunting would be affected by mining under the No Action Alternative.

Other than hunting, little recreation occurs on lands directly affected by the tract (Christenson 2008; Rechsteiner 2008). According to adjacent land managers, some OHV use occurs on approximately 13 miles of OHV-accessible routes in the proposed tract. In addition, visitors traveling along KFO Route 116 engage in sightseeing when traveling between known destinations such as Bryce Canyon National Park and Grand Staircase-Escalante National Monument. These uses would not be affected by mine-related activities under the No Action Alternative because the tract would not be offered for competitive lease sale and no mining would occur.

Existing conditions for other types of dispersed recreation (e.g., camping, picnicking, and hiking) would continue on lands in the recreation analysis area. Because the No Action Alternative would not decrease the amount of land available for dispersed recreation, it would not decrease the recreational experience of those recreational users who engage in recreational activities in the analysis area. Because there are no estimates of recreation use for public or private lands affected by mining activity, there is no way to quantify the amount of recreation users either directly or indirectly affected.

Under the No Action Alternative, other land uses would continue, including livestock grazing, backcountry driving, and vegetation treatments to maintain and enhance livestock forage, wildlife habitat, and watershed condition. These presently occurring land uses would continue to interact with recreation trends in the analysis area similar to current conditions under this alternative.

4.11.3 Alternative B: Proposed Action

Under the Proposed Action, the tract would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the tract. The Proposed Action would directly affect 3,576 acres of land, including 2,280 acres of public land (federal surface and subsurface) on the tract and 1,296 acres of split estate: private surface and federal subsurface land. Under the Proposed Action, the life of the mine would be approximately 25 years.

Under the Proposed Action, some recreation use, predominantly big game hunting, would be displaced from the tract. Approximately 3,576 acres of potential big game hunting areas would be directly affected by the Proposed Action. Hunter access to big game habitat (predominantly mule deer) on the tract would be restricted, displacing them from the tract. It is assumed that all 3,576 acres would be unavailable for recreational use over the life of the mine (25 years). This represents approximately 0.4% of all big game hunting areas in the PPMA (approximately 957,122 acres) and 3.9% of the recreation resources analysis area (92,573 acres). Users would move onto adjacent public lands (public lands and the Dixie National Forest) for hunting opportunities. This could affect the recreational experiences of hunters displaced from the tract and hunters in the analysis area because of a slight increase in crowding in those areas. However, a 0.4% displacement of hunters would not likely lead to overcrowding on other lands in the PPMA.

Hunting in the Alton CWMU would continue, and the same amount of big game permits would be issued as in years past. Approximately 2,145 acres (4.9%) of the Alton CWMU (approximately 43,658 acres) would be directly affected by the Proposed Action. Because no big game kills have occurred in the proposed tract in the last 20 years and the tract does not fall within prime CWMU deer or elk habitat, adverse impacts to hunters who use the CWMU are not anticipated. See Section 4.17 for a description of direct and indirect impacts to big game species as a result of the Proposed Action.

Outside of hunting, little recreation use occurs on lands that would be directly affected by the tract (Christenson 2008; Rechsteiner 2008). Because access would be restricted on the tract, these recreationists, like hunters, would be displaced from the tract for the 25-year mine life. The short-term loss of 3,576 acres for OHV use represents 3.9% of the recreation analysis area (92,573 acres). Further, there is an estimated 13 miles of OHV routes on the proposed tract. Some of this would be removed for mining activity (and replaced post mining), and all would be inaccessible for the life of the mine. The temporary loss of these routes represents a 0.7% reduction in routes available for OHV use across the BLM-KFO (1,402.7 miles of routes are currently available for OHV use in the BLM-KFO). KFO Route 116, an OHV-accessible route, would remain accessible to OHVs during mining operations. However, it is assumed that the road would be relocated to the no-coal zone to allow mining operations to occur. Also, the experiences and settings of OHV users traveling on KFO Route 116 adjacent to the tract would be modified from one characterized as semiprimitive and natural to one characterized by coal mining activities.

Other visitors traveling along KFO Route 116 engage in sightseeing when traveling between known destinations such as Bryce Canyon National Park and Grand Staircase-Escalante National Monument. Mining activity under this alternative would have an adverse effect on users seeking natural visual resources through the loss of natural visual resources over the life of the mine (25 years).

Under this alternative, the direct loss of lands available for other types of dispersed recreation (e.g., camping, picnicking, hiking) would lead to increased use and diminished recreational experiences on lands in the analysis area adjacent to the tract. Up to 92,573 acres (the recreation analysis area) could be indirectly affected by mining operations. Desired recreational experiences for lands in the analysis area include opportunities for undeveloped and self-reliant recreation, a natural environment, and a high probability of solitude. Over the life of the mine, increased use in the analysis area would diminish those recreational experiences. Quantifying the amount of recreation users that would be directly or indirectly affected by this alternative is impossible because of the following: 1) the analysis area is not a known destination point for recreation, 2) there are no known attractions in the analysis area, and 3) there are no estimates of use for public or private lands affected by mining activity.

Because all acres in the tract would be unavailable for hunting, OHV use, and dispersed recreation over the 25-year mine life, the loss of 3,576 acres to recreation opportunities under the Proposed Action would result in a complete decrease in lands available for recreation on the tract when compared to the No Action Alternative.

Under the Proposed Action, and all other action alternatives, Block Sa (186.2 acres) would not be mined and the lessee would apply pre-mining vegetation treatments to the block. Recreational activities on Block Sa may be temporarily disrupted or displaced during vegetation treatment activities. In the short term, post-treatment areas may become less or more attractive to the recreating public, depending on the nature of their activities and their preferred settings. For instance, creating more open areas might enhance wildlife viewing opportunities, but it might also discourage photographers in search of totally natural-appearing, unaltered landscapes. As native vegetation becomes reestablished on treatment areas, those sites could also attract some recreation activities while discouraging others, due to the altered vegetative cover, scenery, naturalness, and use by wildlife species.

4.11.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Under Alternative C, the tract would be modified to exclude Block NW (see Map 2.2). Furthermore, certain mining activities in Block S would be subject to seasonal restrictions to reduce impacts to the local sage-grouse population. Under Alternative C, the modified tract would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the tract. The boundaries of the modified tract would be reasonably consistent with the configuration shown in Map 2.2.

The modified tract under Alternative C would encompass approximately 3,173 acres, of which approximately 2,280 acres are federal surface and mineral estate and 893 acres are split estate: private surface estate and federal mineral estate (Map 2.2 depicts private and BLM surface in the modified tract). Alternative C also anticipates approximately 153 truck round-trips per day to a coal loadout location west of Cedar City. The life of the mine under Alternative C would be approximately 21 years.

Alternative C and the Proposed Action would result in the same types of impacts to recreational resources. However, Alternative C would result in fewer acres of impact based on the smaller acreage of the tract and fewer years of impact based on the shortened mine life. Under Alternative C, hunters would be displaced from the tract because an estimated 3,173 acres of potential big game hunting areas would be unavailable for recreational use over the 21-year mine life. This represents approximately 0.3% of all big game hunting areas in the PPMA (approximately 957,122 acres) and 3.4% of the analysis area (92,573 acres). Hunting in the Alton CWMU would continue, and the same amount of big game permits would be issued as in years past. Approximately 1,985 acres (4.5 %) of the Alton CWMU (approximately 43,658 acres) would be directly affected by the Alternative C. Because no big game kills have occurred in the proposed tract in the last 20 years and the tract does not fall within prime CWMU deer or elk habitat, adverse impacts to hunters who use the CWMU are not anticipated. Assuming that access on the tract would be restricted for the 21-year mine life, OHV users would lose 3,173 acres for OHV use, representing 3.4% of the analysis area (92,573 acres). Likewise, the 13 miles of OHV-accessible routes present on the tract would be inaccessible for the life of the mine and would represent a 0.7% reduction in routes available for OHV use across the BLM-KFO (1,402.7 miles of routes are currently available for OHV use in the BLM-KFO). As under the Proposed Action, KFO Route 116 would remain accessible to OHVs during mining operations, though it is assumed that it would be relocated to the no-coal zone. The experiences and settings of OHV users traveling on KFO Route 116 through the tract would be modified from one now characterized as semiprimitive and natural to one characterized by coal mining activities.

Other visitors traveling along KFO Route 116 engage in sightseeing when traveling between known destinations such as Bryce Canyon National Park and Grand Staircase-Escalante National Monument. Mining activity under this alternative would have an adverse effect on those users and their sightseeing experience through the loss of natural visual resources over the life of the mine (21 years).

Finally, as under the Proposed Action, up to 92,573 acres (the recreation analysis area) could be indirectly affected by mining operations. Recreation users would be displaced from areas directly affected by mining activities and would likely recreate on nearby areas. This would increase the amount of use in those areas and would result in a reduction of the desired recreational experiences in those areas.

Because all acres in the tract would be unavailable for hunting, OHV use, and dispersed recreation over the 21-year mine life, the loss of 3,173 acres to recreation opportunities under Alternative C would result in a complete decrease in lands available for recreation when compared to the No Action Alternative.

4.11.5 Alternative K1: Reduced Tract Acreage

Alternative K1 and the Proposed Action would result in the same types of impacts to recreation. Under Alternative K1, hunters would be displaced from the tract because an estimated 2,114 acres of potential big game hunting areas would be unavailable for recreational use over the 16-year mine life. This represents approximately 0.2% of all big game hunting areas in the PPMA (approximately 957,122 acres) and 2.3% of the analysis area (92,573 acres). Impacts to hunting in the Alton CWMU would be the same as those described for Alternative C, but would occur for five fewer years. Assuming that access on the tract would be restricted for the 16-year mine life, OHV users would lose 2,114 acres for OHV use, representing 2.3% of the analysis area (92,573 acres). Likewise, the 13 miles of OHV-accessible routes present on the tract would be inaccessible for the life of the mine and would represent a 0.7% reduction in routes available for OHV use across the BLM-KFO (1,402.7 miles of routes are currently available for OHV use in the BLM-KFO).

As described under the Proposed Action, KFO Route 116 would remain accessible to OHVs during mining operations, though it is assumed that portions of KFO Route 116 outside of Block NW and Block S would be relocated to the no-coal zone. Similar to the Proposed Action, the experiences and settings of OHV users traveling on KFO Route 116 through the tract under Alternative K1 would be modified from one now characterized as semiprimitive and natural to one characterized by coal mining activities.

Under Alternative K1, there would be 2,114 acres unavailable for hunting, OHV use, and dispersed recreation over the 16-year mine life. Of the 2,114 acres excluded from Alternative K1, 880 acres are private surface estate used for other purposes, and may not currently be available for public recreation opportunities. The loss of land available for recreation under Alternative K1 is 1,462 acres less than the Proposed Action, and would occur for nine fewer years than the Proposed Action.

4.11.6 Potential Mitigation Measures

During mining operations, mitigation measures to offset the loss of sightseeing opportunities could include installing viewing pull-off areas and interpretation panels along rerouted KFO Route 116. This would create new opportunities for sightseeing in the short term.

4.11.7 Unavoidable Adverse Impacts

Adverse impacts from all action alternatives would include a direct short-term loss of land available for recreation opportunities, predominantly hunting. In addition, there would be an indirect adverse impact to other recreational users from the displacement of recreational users, directly affected by mining activity, onto adjacent public and private lands. Following reclamation, existing recreation activities would return to areas previously affected by mining operations. This reclamation could enhance wildlife habitat and increase opportunities for hunting and wildlife viewing.

4.11.8 Short-term Uses versus Long-term Productivity

Mitigation and reclamation measures would be applied to areas affected by the mine; therefore, the long-term productivity of the tract to provide recreation opportunities would not be diminished once mining operations and reclamation are complete.

4.11.9 Irreversible and Irretrievable Commitments of Resources

As a result of mining operations, recreation resources and uses would be irretrievable over the life of the mine. Following completion of mining operations and reclamation, those uses and resources would be reestablished. No irreversible commitments of recreation resources are expected as a result of mining activity.

4.12 Socioeconomics

The socioeconomic analysis depends in part on the findings of other resource sections, primarily the analysis of impacts to recreation (see Section 4.11) and transportation (see Section 4.14). This analysis does not include an in-depth discussion comparing impacts between Alternative A (No Action) and the action alternatives. Both action alternatives would result in impacts to socioeconomics than would not occur under the No Action Alternative because selection of the No Action Alternative would not result in mining the tract.

A number of public concerns pertaining to this section were raised in comments on the DEIS. In response to these comments, the analysis of impacts to employment, familial relationships, housing, property values, tourism, and EJ has been expanded and updated. In addition, passionate statements were made by several individuals during scoping about the need for local employment as a means for families to return to or continue to live in the area. Also, numerical data in this section have been updated whenever appropriate, based on more recent U.S. Census numbers, updates of previously cited reports, and current economic conditions.

The analysis presented in this section is only as strong as the current state of knowledge within the social science of socioeconomics generally, and within that of socioeconomic impact assessments specifically. Socioeconomic impact assessments use both qualitative and quantitative measures to evaluate the impacts economic development has on community social and economic well-being. In this section, attempts are made to predict various social impacts as a result of proposed economic changes. Predicting these impacts is not a precise endeavor. Analyses can be aided by a combination of economic models, relevant research, case studies, and published government data on existing economic and social conditions. Oftentimes, regional economic models such as IMPLAN are relied on. In this case, modeling was not appropriate because there are no existing regional mine-related data available (over the necessary timescale) for input into the model. Having similar economic examples as those planned for analysis is a key component of IMPLAN’s regional predictive capabilities. Instead, relevant research, government-produced data for the SESA and communities within, and similar case studies were used to produce an impacts analysis balanced in both qualitative and quantitative measures.

4.12.1 Regulatory Framework

Federal, state, and local regulations require that surface mines obtain reclamation bonds, pay royalties, and taxes based on the amount of coal extracted from the mine. Further, the Coal Mine Safety Act: UAC 40-2 of 2008 established the Office of Coal Mine Safety, which recommends to the governor measures that ensure the safety of those involved in Utah’s coal mine industry.

4.12.2 Alternative A: No Action

Under the No Action Alternative, coal in the tract would not be mined; therefore, no impacts would occur to the social and economic conditions of nearby communities in Kane, Garfield, and Iron counties as a function of mining the tract. The local population, employment, fiscal conditions, tourism rates, and social climate would remain similar to current conditions, but 160 direct and 240–480 indirect jobs that would be produced by all action alternatives would be foregone. It is also possible that the jobs at the current mine (approximately 34) would be lost under the No Action Alternative (ACD 2013). Revenues from livestock grazing and recreation opportunities in the tract would continue. When compared to the Proposed Action, the No Action Alternative would result in the potential for forgone income for the successful bidder and revenue and royalties to federal, state, and local governments because the coal would not be mined and this revenue would not be generated.

4.12.3 Alternative B: Proposed Action

Under the Proposed Action, approximately 44.9 million tons of coal would be mined over a 25-year period (this equates to approximately 1.8 MMTPY though the target production rate, which is reflected in the socioeconomic analysis in this section, is 2 million TPY). To conduct mining and transportation operations over the life of the mine, approximately 160 employees would be required, and an estimated additional 240–480 indirect jobs would be created in the SESA assuming a range of economic multipliers (indirect employment to direct employment) from 2.5 to 4.0. An estimated 153 truck round-trips per day to and from the mine and along the reasonably foreseeable coal haul transportation route would occur. Mine operations would occur 24 hours a day, five to seven days a week, for the life of the mine. The Proposed Action would directly affect (by surface disturbance, precluded access, or both) 3,576 acres of land consisting of 2,280 acres of BLM-administered land (federal surface and subsurface) and 1,296 acres of private land (private surface and federal subsurface).

The projected (target), annual coal production under both action alternatives would be approximately 2 million short tons. This analysis considers 1.8 million short tons as the annual target amount under both action alternatives. It also provides recovery values and revenues for the range of recoverable coal reserves throughout the life of the mine under each action alternative (44.9 million short tons over approximately 25 years under the Proposed Action and 38.1 million short tons over approximately 21 years under Alternative C).

To understand the amount of electrical energy that would be generated from the projected annual amount of coal (2 million short tons) produced under the action alternatives, the following statistics are provided. These numbers are for perspective use only because it is not assumed that the coal mined from the tract would be used solely to supply electric energy to residential customers. Under the Action Alternatives, the number of United States households provided with one year of residential energy from 2 million short tons of coal would be approximately 185,010. According to the U.S. Census Bureau (U.S. Census Bureau 2013j) (2013), there are 2.6 persons per household on average in the United States. As such, 2 million tons of coal would provide approximately 480,000 individuals with one year of residential electrical energy (McKenzie 2008).

When compared to the No Action Alternative, the Proposed Action would result in an increase in employment, personal income, and government revenues. A slight increase in population is anticipated (as illustrated in the analysis below), but this would not necessarily lead to an increased need for public services. Under the No Action Alternative, no mining would occur, and therefore an increase in local employment, income, and government revenues as a result of mining would not occur. Under the Proposed Action, there would be a slight decrease in grazing revenues as a result of a decrease in AUMs (as illustrated in the analysis below). Also, any recreation-related economic contributions from individuals who choose to recreate on the tract would be foregone under the Proposed Action.

4.12.3.1 EMPLOYMENT AND INCOME

4.12.3.1.1 Employment

Under the Proposed Action, approximately 160 people would be employed to conduct mining operations. It is estimated that 100 workers would be needed at the mine for mining operations, and 60 workers would be required for trucking the coal to the loadout location. Approximately 10% (16 employees) of the mine employees would be specialists in coal mining operations and would relocate to the area specifically to work at the mine (McCourt 2008). These job figures could fluctuate based on industry demand and mine production levels.

Due to the physical distance and practical driving routes (especially in winter), mine employees would likely come from Kane and Garfield counties. These direct mine jobs would represent some 4.7% of the nonfarm employment level of these counties (U.S. Census Bureau 2013i). A like percentage in Salt Lake County, for the purpose of providing context for this analysis, would represent over 23,000 nonfarm jobs (U.S. Census Bureau 2013).

If the tract provides direct jobs to residents of Kane County, they would benefit in terms of wages, benefits, and job security. In addition, the local government would benefit from taxes collected from local residents employed as a result of the Proposed Action.

Employment related directly to coal mining operations would generate indirect jobs in the local economy. Indirect employment associated with the mine would include jobs in wholesale and retail trade, local government, and service sectors. Using a range of economic multipliers (indirect employment to direct employment) from 2.5 to 4.0, it is estimated that approximately 240–480 additional jobs (full- or part-time equivalents) would be generated as a result of mining operations on the tract. The economic multiplier of 4.0 comes from the Rocky Mountain Coal Mining Institute's 2009 estimates for direct and indirect Utah coal mining employment (Rocky Mountain Coal Mining Institute 2009), whereas the 2.5 multiplier comes from a University of Utah Bureau of Economic and Business Research report titled *The Structure and Economic Impact of Utah's Coal Industry*, which estimates direct and indirect Utah coal mining employment for the same year (Perlich et al. 2010).

Because a large portion of services directly and indirectly related to mining (e.g., fuel, equipment purchases and repairs, food, and retail services) would be in or around Cedar City in Iron County, it is likely that the indirect employees would be concentrated in this area as well.

4.12.3.1.2 Income

The range in salary for miners on the tract would be $18 to $21 per hour, not including benefits (McCourt 2008). Using $20 as an estimated average, the approximate annual wage for coal miners on the tract would be $41,600. Thus, the 160 employees of ACD would generate $6.65 million in total annual wages in the SESA and $166 million over the life of the mine under the Proposed Action. Employment and income impacts are shown in Table 4.12.1.

Table 4.12.1. Annual and Life-of-mine Employment and Income Impacts under the No Action Alternative, the Proposed Action, Alternative C, and Alternative K1 (in 2013 dollars)

	Alternative A (No Action)	**Alternative B (Proposed Action)**	**Alternative C (Reduced Tract Acreage and Seasonal Restrictions)**	**Alternative K1 (Reduced Tract Acreage)**
Direct employment (number of employees)	0	160	160	160
Indirect employment (number of employees)	0	240–480	240–480	240–480
Total annual wages (for direct employment)	$0	**$6.65 million**	**$6.65 million**	**$6.65 million**
Total life-of-mine wages (for direct employment)	$0	**$166 million**	**$140 million**	**$107 million**

4.12.3.1.3 Economic Contribution of Utah-produced Coal for Export[6]

In 2011, approximately 6% of Utah-produced coal was exported abroad, resulting in economic contributions in the form of employment, labor income, and gross value added in three distinct categories: export coal production, downstream transportation, and port operations and cargo handling. Assuming a 6% annual export figure for coal produced at the Alton Coal Tract (108,000 short tons), its share of annual economic export benefit is estimated in Table 4.12.2, as calculated for the State of Utah in *U.S. Coal Exports: National and State Economic Contributions* (Ernst & Young LLP 2013).

Table 4.12.2. Estimated Annual Economic Contribution of Alton Coal Tract–produced Export Coal

Estimated Economic Contribution	Category	Direct	Indirect and Induced	Total
Employment (number of full- and part-time employees)	Export coal production	20	60	80
	Downstream transportation	8	37	45
	Port operations and cargo handling	–	3	3
	Total	**28**	**100**	**128**
Labor income (millions of 2011 dollars)	Export coal production	$1.9	$2.7	$4.6
	Downstream transportation	$1.0	$1.4	$2.4
	Port operations and cargo handling	–	$0.1	$0.1
	Total	**$2.7**	**$4.2**	**$6.9**
Gross value added (millions of 2011 dollars)	Export coal production	$3.6	$5.1	$8.7
	Downstream transportation	$1.5	$2.5	$4.0
	Port operations and cargo handling	–	$0	$0
	Total	**$5.1**	**$7.8**	**$12.9**

4.12.3.2 GOVERNMENT AND PUBLIC FINANCE

Under the Proposed Action, approximately 1.8 million tons of coal would be mined each year, and approximately 44.9 million tons of recoverable coal would be mined over the 25-year mine life. The average sales price of coal in Utah was $35.78 in 2012 (Utah Geological Survey 2013a). The spot price for coal recovered in the tract would be slightly lower given that this coal heating value is lower than the Utah average. This analysis uses $32.00 per ton as the spot price. Spot prices for coal with a heat content more closely approximating the coal in the tract were not available to use in the analysis.

The annual sales value for 1.8 million tons of coal would be approximately $57.6 million (1.8 million tons of coal × $32.00). Over the 25-year mine life, recovery values would be approximately $1.44 billion (1.8 million tons × $32.00 × 25 years).

[6] Analyses of the potential impacts of exported coal are limited to the socioeconomics section because pertinent data were available to reasonably estimate potential economic impacts. Analyzing the impacts of exporting coal on other resources would be impractical and speculative because reasonable and foreseeable details regarding where the coal would be sold and how it would be transported are unknown.

4.12.3.2.1 Federal Royalties

Coal producers in the State of Utah must pay royalties to the United States government for coal mined on federal lands. The current royalty rate for surface mined coal is 12.5% of sales value and is paid to the DOI ONRR. Approximately 50% of the royalties are returned to the state where the mineral production occurs.

Assuming the annual recovery value for the coal produced under the Proposed Action would be $57.6 million per year, $7.2 million in royalties would be paid to ONRR ($57,600,000 × 0.125), and the State of Utah would receive approximately $3.6 million (approximately 1/2) per year. Under the Proposed Action, approximately $180 million in royalties would be paid to ONRR and $90 million would be disbursed to the State of Utah over a 25-year period.

Upon disbursement of royalty revenues to the State of Utah, more than 75% of the mineral revenue receipts are routinely appropriated to several state agencies. The distribution is as follows: 32.5% to the Permanent CIB, 40.0% to the UDOT for distribution to counties and county special service districts, and 5.0% to the Utah Department of Community and Culture for distribution to counties and special service districts. Projected appropriations as a result of mining the tract under each alternative, including the Proposed Action, are listed in Table 4.12.3.

Table 4.12.3. Estimated Recovery Value and Royalty Revenue under the No Action Alternative, the Proposed Action, Alternative C, and Alternative K1

	Alternative A (No Action) Annual and Life of Mine Values	Alternative B (Proposed Action), Alternative C, and Alternative K1 Annual Values (1.8 million short tons)	Alternative B (Proposed Action) Life of Mine Value (25 years of production)	Alternative C Life of Mine Value (21 years of production)	Alternative K1 Life of Mine Value (16 years of production)
Recovery value	$0	$57.60 million	$1.44 billion	$1.21 billion	$921.6 million
Total federal royalty revenue	$0	$7.20 million	$180.00 million	$151.20 million	$115.20 million
Royalties disbursed to state (50% of federal royalties)	$0	$3.60 million	$90.00 million	$75.60 million	$57.60 million
Appropriation to CIB (32.5% of state revenue)	$0	$1.17 million	$29.25 million	$24.57 million	$18.72 million
Appropriation to UDOT (40% of state revenue)	$0	$1.44 million	$36.00 million	$30.24 million	$23.04 million
Appropriation to Utah Department of Community and Culture (5% of state revenue)	$0	$180,000	$4.50 million	$3.78 million	$2.88 million

Under the Proposed Action, 92 AUMs allocated to livestock grazing would be lost annually. This loss of AUMs would total 3,220 over the life of the mine. The 2013 value of an AUM, according to the BLM, is $1.35. Thus, over the life of the mine (35 years for livestock grazing, 25 years for the mining activities, and 10 years for reclamation) a $4,347.00 (or $124.20 annually) decrease in contributions to the BLM would result. Should livestock permittees need to decrease livestock numbers as a result of the decrease in AUMs, this could result in lost revenue for permittees and a potential decrease in the workforce required to manage the livestock. However, with annual rotations in the tract over the life of the mine, adverse impacts to permittees would be minimized.

4.12.3.2.2 Additional Taxes and Fees

Black Lung Tax: The Black Lung Excise Tax on coal has been in effect since 1978. The tax finances the Black Lung Disability Trust Fund, which compensates miners (and their survivors and dependants) that have contracted “black lung disease” or pneumoconiosis. The current Black Lung Excise Tax rate for surface mines is $0.55 per ton. Under the Proposed Action, approximately $990,000 million annually and $24.7 million over the life of the mine would be paid to the Black Lung Disability Trust Fund (Table 4.12.4).

Table 4.12.4. Additional Taxes and Payments Associated with the No Action Alternative, the Proposed Action, Alternative C, and Alternative K1

	Alternative A (No Action) Annual and Life of Mine Values	Alternative B (Proposed Action) and Alternative C Annual Values (1.8 million short tons)	Alternative B (Proposed Action) Life of Mine Value (25-year mine life)	Alternative C Life of Mine Value (21-year mine life)	Alternative K1 Life of Mine Value (16-year mine life)
Black Lung Tax	$0	$1.0 million	$24.7 million	$20.8 million	$15.8 million
Abandoned Mine Land Tax	$0	$270,000	$6.8 million	$5.7 million	$4.3 million
Bonus bid payment	$0	n/a	$13.5–$20.2 million	$11.3–$17.0 million	$9.0–$13.5 million
Bonus bid payment disbursed to state (50% of federal payment)	$0	n/a	$6.8–$10.1 million	$5.7–$8.5 million	$4.5–$6.8 million

Abandoned Mine Lands: A reclamation fee of $0.15 per ton is assessed by the federal government on domestically produced, underground-mined coal to pay for the cleanup of abandoned mine lands. The fund was designed to be split evenly between the federal government and the state from which the money was generated. Assuming 1.8 million tons of coal are mined annually, $270,000 would be paid to the abandoned mine lands program and $6.8 million would be paid over the 25-year mine life.

Bonus Bid Payments: Before mining can begin in the tract, a company (or companies) must submit a sealed bid for the coal. The successful bidding company must pay one fifth of the total bonus at the time of the sale and would continue to pay one fifth every year for the next four years. The bid money would be paid to the federal government regardless of the production taxes and royalties that are paid by the mining company as the coal is mined. The federal government would keep half of this bonus bid payment and the State of Utah would receive the other half.

Although the exact amount of bid money anticipated through the lease of the tract is unknown, recently awarded bonus bids can be used to estimate potential federal and state revenue. In recent years, the bonus bids in Utah have varied from approximately $0.30 to $0.45 per recoverable ton for underground coal (McKenzie 2013). Using the same amount per ton and the assumption that 44.9 million tons of coal would be recovered over the life of the mine (under the Proposed Action), the successful bidder on the tract would pay between approximately $13.5 and $20.2 million to the federal government. Of the total bonus bid, between $6.8 and $10.1 million would be disbursed to the State of Utah.

Property Tax, Sales Tax, Equipment Costs, and Fuel Costs: The Utah Property Tax Division centrally assesses the ad valorem tax based on coal production, assessed property values, and current tax rates. Ad valorem taxes assessed on property and production generate revenue for local counties. The greater the production of coal, the greater the generation of property taxes for Kane County.

Sales and use taxes are levied by state and local governments on purchases of goods and services related to coal mining. The sales tax rate for Iron County is 5.95% and the sales tax for Kane and Garfield counties is 6.95%. The tax payments would indirectly benefit the local and national businesses supporting the coal mine operations. These economic impacts would be present throughout the life of the mine and to a lesser extent during the reclamation activities. It should be noted that because such a large percentage of mine-related services would be found in Cedar City, increases in sales tax revenues would be disproportionately higher in Iron County when compared to Kane and Garfield counties. Kane County conducted an analysis to estimate additional economic impacts to the county as a result of the mine under the Proposed Action. Results of this analysis are shown in Table 4.12.5, and figures were estimated for Alternatives C and K1 based on the life of the mine timespan reduction (in years).

Table 4.12.5. Additional Estimated Economic Impacts of Alternative A, the Proposed Action, Alternative C, and Alternative K1 (Kane County)

Economic Benefit	Alternative A (No Action)	Proposed Action (25-year mine life)	Alternative C (21-year mine life)	Alternative K1 (16-year mine life)
Fuel expenditures (mining) (at $4/gallon)	$0	$312,000,000	$262,080,000	$199,680,000
Fuel expenditures (trucking) (at 43.5 tons/load, 208-mile round-trip/load, at $4/gallon)	$0	$179,310,345	$150,620,690	$114,758,621
Equipment maintenance (mining and trucking)	$0	$165,324,138	$138,872,276	$105,807,448
Federal fuel tax collected at 24.4¢/gallon	$0	$25,211,931	$21,178,022	$16,135,636
State fuel tax collected at 24.5¢/gallon	$0	$25,315,259	$21,264,818	$16,201,766
Sales taxes (direct and indirect)	$0	$21,554,323	$18,105,631	$13,794,767
Property taxes paid (mining equipment and facilities)	$0	$2,543,450	$2,136,498	$1,627,808
Property taxes paid (trucking equipment and facilities)	$0	$3,423,875	$2,876,055	$2,191,280

Source: Kane County (2012).

The amount of property tax revenues and sales tax shares that Kane County can collect is greatly restricted due to the high percentage of federal land that restricts residential and commercial development within the county. Therefore, the promotion of multiple use activities on federal lands within the county generally improves Kane County’s tax base. If multiple use activities on public lands are restricted, the overall tax base in Kane County is negatively impacted, including loss of revenues to local businesses and property and sales taxes collected.

Permanent CIB: As previously mentioned, Kane, Garfield, and Iron counties receive a portion of federal mineral lease monies returned to the State of Utah by the federal government through the CIB. The funds received by counties in the SESA for infrastructure projects would likely continue in amounts similar to current contributions regardless of the alternative selected, because CIB funding is not directly correlated with mineral production by county but rather by applicant eligibility. An estimated appropriation to the State of Utah as a result of the Proposed Action is given in Table 4.12.3.

Payments in Lieu of Taxes Program: Given that none of the alternatives would result in changes in federal land ownership in the SESA, Payments in Lieu of Taxes payments to Kane, Garfield, and Iron counties would remain similar to current conditions under all alternatives, including the No Action Alternative.

4.12.3.3 POPULATION AND HOUSING

As mentioned earlier, it is assumed that 90% (144 employees) of employees would commute from in the SESA and 10% (16 employees) of the 160 employees would relocate to the SESA. The average size of a family in the United States is 3.14 according to the 2000 U.S. Census (U.S. Census Bureau). Assuming in-migrants family size is similar to the United States average, approximately 50.24 additional people would move into the SESA during the life of the mine. Adding an additional 16 workers and their families concentrated in Kane County or dispersed throughout the SESA would have negligible impacts on population. Using the population data given in Section 3.12, the total population in the SESA is 58,593. An additional 50.24 people in the SESA would result in a 0.09% increase in the population of the SESA.

Although 16 employees would likely come from outside the SESA, the remaining employees would likely come from local communities. Given that 90% of the potential workforce is currently living in Kane, Garfield, and Iron counties, it is not anticipated that the demand for housing in the area would increase under the Proposed Action. The current housing market would accommodate the small percentage (0.09%) of in-migrants for short- or long-term housing because accommodations for 16 families in the SESA would likely be present at any given time.

As noted in Section 3.12 second-home ownership is largely influenced by scenic beauty and recreation opportunities. For many individuals, mining operations on the tract would detract from the desirable qualities associated with scenic views and recreation. As such, individuals may choose not to obtain second homes near the tract. However, because most of the second homes in Kane County are on Cedar Mountain (approximately 30 miles away from the tract), it is unlikely that most of the potential second-home purchases would be adversely impacted. Potential second-home purchases in Iron and Garfield counties are not likely to be adversely impacted by the Proposed Action given the distance from the tract.

In addition, numerous factors influence retirees' decisions regarding where to retire (including pre-existing ties to an area, affordability, and access to certain amenities); these decisions vary widely with individual choice and preference. Duncombe et al. (1999) found that, in general, retirees valued low housing prices, low tax rates, relatively high spending on public services by local governments (police, fire, etc), and access to amenities such as warm weather and coastlines. One study of survey respondent retirees who had moved to North Carolina found that retirement mobility was greatly associated with pre-existing social ties to a particular location. Two thirds of respondents had friends, family, or children living in the area that they migrated to or had previously lived or vacationed there. Of the survey respondents reporting social ties, 14% of that portion (9.3% of the total) of retirement migration was attributable to prior vacation experiences. The other third of respondents' retirement migration was attributed to "cold call" moves, because they did not have any pre-existing social ties to the area (Haas III et al. 2009). According to this survey, it is possible that some portion of the 9% (those with prior vacation experiences) and 30% (those choosing to "cold call" move to an area) of retirees, respectively, could choose not to move to the area because of perceived negative impacts of the Proposed Action.

The transportation analysis in Section 4.14.3 identifies a potential 4% increase in average daily traffic (ADT) on US-89 and a 2% increase on SR-56 along the most reasonably foreseeable coal haul route. A traffic study conducted by Fehr and Peers (2013) shows that LOS C or better would be maintained on all road segments and intersections of this route (see Section 3.14 for definitions of LOS levels). Though it is impossible to predict the exact route that a successful bidder might choose, given the slight increase in ADT and the limited congestion as reflected in the expected LOS levels, adverse impacts to property values along the reasonably foreseeable coal haul transportation route are not anticipated.

Should mining operations on the tract be perceived as an undesirable land use in areas near the tract, adverse impacts to the value of nearby property could be experienced. Several studies indicate that undesirable land uses, such as a power plant, superfund site, hazardous waste site, or landfill, do have a tendency to decrease the reported dollar value of a residence because of perceived disamenities, such as noise, traffic, air pollution and obstruction of view. The decrease in value is typically dependent on the distance (miles) from the site and can vary considerably depending on the existing land use, culture, amenities, housing markets, and size of the industrial site.

Hedonic valuation is a method of including the influence of external factors such as environmental amenities in the explanation of demand or price for a particular good. Although the empirical literature includes many hedonic valuation studies spanning the past several decades, most of these focused on impacts from hazardous waste sites and nuclear reactors. Very few have focused specifically on the impact of surface mining on surrounding property values.

A recent hedonic pricing study published by the University of Tennessee investigates the impacts that surface coal mines have on residential home values. The study (a dissertation) looked at 13 states, including Wyoming, that were characterized as having “high surface mining activity,” defined as a state with five or more active surface coal mines. The study area included all of the counties in the 13 states (not just those with active coal mines), which totaled 1,154 counties. The average home value in the study area was $103,501.64, whereas SESA counties had median home values of $172,500 (in 2011 dollars). The study found that median home values declined as numbers of surface coal mines increased. In particular, the study estimated that the addition of a surface mine to the average county decreased residential property values between 0.34% and 1.7% (Williams 2011). If one were to apply this to the average home in Kane County, the impact would be a reduction in sale price of between $583.44 and $2,917.20 for homes with current median values of $171,600 in Kane County. This study is limited, however, in that it did not account for reduction in impacts as home distance increases from a mine site.

Another hedonic study examined the effects on single-family home sale prices from a nearby landfill in Minnesota over a 10-year period (1979–1989). The study found that homes adjacent to the landfill suffered a reduction in sale prices of approximately 12%, whereas those located 1 mile from the site saw approximately a 6% reduction while controlling for other variables such as the age of the home, number of bedrooms, and number of bathrooms. The study found that the landfill’s negative effect on home values only applied to homes within 2 miles of the site. Another similar study found that properties within 2.5 miles of a power plant had a 6.3% reduction in property values as a result (Boyle et al. 2001).

According to U.S. Census (U.S. Census Bureau 2007–2011a), the town of Alton had 63 housing units (10 of which were vacant) with median home values of $195,000. County assessor tax parcel data were analyzed in relation to their distance from Block NW (the block closest to the town of Alton).

Approximately 112 municipally zoned county tax parcels intersect a 2.5-mile buffer of the tract under the Proposed Action. See Table 4.12.6 for detail regarding the number of parcels with and without associated addresses (indicating a residence) within each analyzed buffer zone.

Table 4.12.6. Municipally Zoned Parcels in the Town of Alton Close to the Tract under the Proposed Action and Action Alternatives

Buffer Zone (miles)	Proposed Action		Alternatives C and K1	
	Municipally Zoned Parcels Intersecting Buffer	**Municipally Zoned Parcels Intersecting Buffer with Mailing Address**	**Municipally Zoned Parcels Intersecting Buffer**	**Municipally Zoned Parcels Intersecting Buffer with Mailing Address**
0–1	106	43	12	5
1–2	13	2	103	40
2–3	5	3	9	0

Source: Utah AGRC (2013).

Note: County tax parcels that overlap more than one buffer zone are counted in each zone; therefore, double and sometimes triple counting may occur.

All of the parcels zoned municipal in Alton are within the 3-mile buffer of the mining blocks under the Proposed Action. Approximately 106 municipally zoned parcels (43 with mailing addresses associated) intersect a buffer zone of 0–1 mile from the tract (Block NW) under the Proposed Action. Approximately 13 parcels are within the 1- to 2-mile buffer zone, of which two have a mailing address listed in the parcel data. Lastly, within the 2- to 3-mile buffer zone, five parcels are zoned municipal and three have mailing addresses associated with them. The same data are listed in Table 4.12.6 above for Alternatives C and K1, which are identical in terms of proximity of mining to the town of Alton (Utah AGRC 2013). Based on the hedonic pricing studies cited above, impacts in terms of a reduction in sale price of the homes and properties in the SESA could be as low as 0.34% and as high as 12.0%.

Most hedonic pricing studies focus on the negative impact of an undesirable land use or site near residential properties, and little have looked at the positive impact of a site cleanup or remediation on home values. Dale et al. (1999) and McComb (2004) report that property values consistently rebounded for homes near sites following cleanup or remediation, but that the areas closest to the site rebounded more slowly than those farther away. Therefore, as reclamation of mined lands occurs, it is expected that any reduction in home or property value would be restored, with those homes and properties closest to the tract rebounding slower than those further away. Because reclamation is concurrent with mining, the reduction and restoration of property values could occur over the life of the mine, with potential impacts to home and property values lasting 35 years. The restoration of property values following mine reclamation, however, would not necessarily be felt by all current property owners, as some may not have the opportunity to experience property value restoration within their lifetimes.

Though hedonic pricing studies are valuable in assessing impacts to property values of various environmental amenities, they do have certain limitations. Limitations include the ability to discern outside market valuation influences on home values such as the overall housing market trends, suggesting that studies over long periods are more valuable. In addition, the amount that amenities influence the general population when purchasing a home vary widely across groups. For example, some home buyers are unwilling to move regardless of undesirable land use impacts. Others will accept certain undesirable land uses because they are offset by other desirable ones. Still, others deliberately locate to these areas seeking lower home values or access to certain home amenities (e.g., larger home size and more bedrooms), the costs of which are offset by the undesirable land use. Another limitation to using the hedonic valuation method is that in some cases, the addition of an undesirable land use can actually raise property values. For example, positive wage effects can often offset undesirable land uses in areas where a locally enhanced job market is created by industry, resulting in no change or increases to property values despite external disamenities (de Vor et al. 2009).

4.12.3.4 TOURISM

Section 4.11 identifies potential impacts to recreation due to the implementation of the Proposed Action. As stated in Section 4.11.2, there are currently no estimates for the amount and type of recreation use on or near the tract. The KFO RMP (BLM 2008b) states that information for recreational visitation based on actual use and economic expenditure data associated with such use are not available for the field office. Table 3.12.14 describes generalized estimates for nonmarket recreational use values on public lands in the Inter-mountain West. Because specific nonmarket use values are not available for the KFO and areas on and near the tract, it would be speculative to make quantitative estimates of the potential economic impact to the region from a potential decrease in use of recreation resources in the area. That said, qualitative discussions of impacts to nonmarket land us values can assist decision makers when considering a proposed versus existing land use (BLM 2010a).

Under the Proposed Action, recreation on the tract would be restricted for the life of the mine. Therefore, any nonmarket recreational use values associated with land on the tract would be eliminated ($0) until reclamation is complete. Nonmarket recreational use values on public lands adjacent to and near the tract would likely decline for the life of the mine. In addition, in places on public land from which the tract is visible (such as the nonmotorized trails in the Dixie National Forest east of the tract), nonmarket recreational use values would also likely decline. If nonmarket recreational use values were to decline in these areas, it is possible that recreation use would also decline or be relocated to areas with less or no impact. See Section 4.2.3.1.2 for more information regarding visual impacts to lands near the tract under the Proposed Action.

The Proposed Action would displace 3,576 acres of potential big game hunting. This represents approximately 0.4% of all big game hunting areas in the PPMA. Users would likely move onto adjacent public lands (BLM-administered lands and the Dixie National Forest) for hunting opportunities. Because hunters would be able to hunt on adjacent public lands and because the overall percentage of lands unavailable to big game hunting in the PPMA is less than 1%, it is unlikely that hunters would be adversely impacted by the Proposed Action. Direct and indirect sales and revenue generated by this recreational user group would continue similar to current conditions.

Privately issued big game hunting and viewing permits in the Alton CWMU would be impacted by the loss of available habitat and surface-disturbing activities. Hunting in the Alton CWMU would continue, and the same amount of big game permits would be issued as in years past. Approximately 2,145 acres (4.9%) of the Alton CWMU (approximately 43,658 acres) would be directly affected by the Proposed Action. Because no big game kills have occurred in the proposed tract in the last 20 years and the tract does not fall within prime CWMU deer or elk habitat, adverse impacts to hunters who use the CWMU are not anticipated.

As stated in Section 4.11.2, there is little recreation use that occurs on lands that would be directly affected by the tract. In addition to big game hunting, OHV use is the only other identified recreation use on the proposed tract. For the 25-year mine life, OHV users would be displaced from 3,576 acres (assuming that access to the tract would be precluded for the life of the mine); although, KFO Route 116 (an OHV accessible route) would remain accessible to OHVs during mining operations. The experiences and settings of OHV users traveling on KFO Route 116 through the tract would be modified from one now characterized as semiprimitive and natural to one characterized by coal mining activities. It would be speculative to assume that a change in landscape characterization along KFO Route 116 would preclude future OHV use.

From a qualitative perspective, the shift in landscape characterization from semiprimitive and natural to one characterized by coal mining would also be absorbed by local residents in the area who enjoy and/or depend on the naturalness of the area for their livelihood. An increase in truck traffic in and near Alton and communities along the reasonably foreseeable haul route such as Hatch and Panguitch would likely alter the essence of the rural community feel and semiprimitive landscape in these locations. The coal haul transportation route that is used for analysis purposes is the most reasonably foreseeable route, but it is impossible to predict the exact route that a successful bidder might choose. Individuals who moved to these areas specifically because of the rural feel and semiprimitive landscape, or those who operate tourist-related businesses, would likely notice a change in the social climate of the area. Although the transportation analysis anticipates negligible impacts to traffic flow or the ADT from a quantitative perspective (see Section 4.14), the frequency and noise of the daily truck traffic would adversely impact the quaint, small-town feel of Alton and communities along the reasonably foreseeable haul route. Altering the essence of these communities through daily truck traffic, noise, artificial lighting, and other mine-related operations could deter tourists from visiting Alton and the communities along the reasonably foreseeable haul route. If tourists choose not to visit the area because of the mining operations, tourist-related revenue would not be generated and tourist-dependent businesses would be adversely impacted.

While discussing potential negative impacts to tourism from the Proposed Action, it is important also to discuss generally the range of impacts that tourism itself has on rural regions and tourist-based economies. This is because tourism has both positive and negative effects, often placing the multi-part mission goals of national parks (attracting visitors and preserving the natural landscape and wildlife) into conflict with one another. Positive economic impacts of tourism include jobs for local residents, income for local economies, the preservation of rural services and businesses, and an increase in demand for local goods and services. Positive effects to the natural environment can include the preservation or improvement of environmental amenities due to visitor expectations of a scenic and/or nature-based experience. Negative economic impacts of tourism include that jobs provided are often low-paying and/or seasonal in nature, the demand for local goods and services can drive up costs for the resident population, goods and services provided can cater to the needs of tourists and not those of the resident population, and the demand for second homes can inflate housing costs for the resident population. Negative effects to the natural environment can include traffic congestion, air pollution, wildlife disturbance and mortality, and damage to the natural landscape in the form of litter, soil erosion, and vandalism (Association of National Park Authorities 2013).

The BLM received comments from the public regarding concern over the proposed lease’s potential impacts to the tourism-based economy in the SESA, and to Bryce Canyon National Park in particular. Visitors to Bryce Canyon could encounter the impacts of proposed mine activities in the form of increased traffic, increased noise and vibration, night sky impacts, and air quality impacts (see Section 4.2 for potential impacts to night sky and soundscapes and Section 4.3 for potential impacts to air quality). To quantify potential impacts to tourism as a result of the Proposed Action, the relationship between highway traffic and tourism was analyzed. This analysis compares Bryce Canyon visitation to highway traffic levels over a five-year period using NPS visitation statistics alongside AADT for key sections of the reasonably foreseeable haul route that overlap routes tourists use to access the park (Table 4.12.7). UDOT AADT numbers presented include all passenger vehicles, combo trucks, and single trucks. Traffic counts at Bryce Canyon’s entrance station were also included for reference.

Table 4.12.7. Bryce Canyon National Park Visitation and AADT for Selected Road Segments 2007–2011

Year	2007	2008	2009	2010	2011
Bryce Canyon National Park Visitation (thousands)	1,013	1,043	1,216	1,285	1,296
AADT for I-15 (SR-271 Paragonah)	16,785	15,510	16,320	16,645	16,445
AADT for SR-20 (I-15 Panguitch Interchange to SR-89)	1,520	1,635	1,665	1,700	1,480
All SR-89 Segments (300 North Hatch, SR-12 Red Canyon, Road to Rodeo grounds Panguitch)	7,985	7,055	7,650	7,715	7,000

Sources: NPS (2013a) and UDOT (2007, 2008, 2009, 2010, 2011).

When comparing Bryce Canyon visitation to AADT (which includes truck traffic numbers) over a five-year period for sections of the reasonably foreseeable haul route that overlap tourist access routes to Bryce Canyon, it is apparent that visitation has steadily increased despite traffic fluctuations on the highway segments. For example, AADT on SR-20 steadily increased from 2007 to 2010 and then dropped 13% in 2011, whereas visitation to Bryce Canyon over the same timeframe increased by 28%. On SR-89 road segments that overlap the reasonably foreseeable haul route, AADT fell by 12% from 2007 to 2008, increased by 8% from 2008 to 2009, and then dropped by 8% from 2010 to 2011. In the meantime, visitation to Bryce Canyon increased on average by 7% each year. In addition, 2012 saw 1,385,000 visitors to Bryce, 7% more than attended the previous year (AADT data were not available for 2012). The data presented in Table 4.12.7, show that when traffic levels increase on the road segments in question, visitation does not necessarily fall as a result.

Local recreation and tourism can be adversely and indirectly impacted by the mining industry if local lodging is disproportionately used by the mining employees, displacing visitors seeking hotel accommodations. Under both action alternatives, this is not likely to happen because nearly all of the 160 employees would be residents of Garfield, Iron, or Kane counties; thus, the existing stock of motel rooms in the SESA would continue to meet the demands of tourists to the area. Lastly, mining operations would likely draw nonmine personnel to the area for miscellaneous support and sales activities, such as equipment sales and repair, consulting services, regulatory activities, and others. This could lead to additional needs for hotels, housing, and restaurant facilities.

4.12.3.5 PUBLIC HEALTH AND SAFETY

4.12.3.5.1 Transportation

The transportation analysis in Section 4.14.3 identifies a potential 4% increase in ADT on US-89 through Hatch and Panguitch and a 2% increase on SR-56 through Cedar City. A traffic study conducted by Fehr and Peers shows that LOS C or better would be maintained on all road segments and intersections of the reasonably foreseeable coal haul transportation route (Fehr & Peers Transportation Consultants 2013) (see Section 3.14 for definitions of LOS levels). Given the slight increase in ADT and the limited congestion as reflected in the expected LOS levels, adverse impacts to public health and safety are not likely. Although it is plausible to consider that an increase in traffic on any given roadway would increase the potential risk for an accident, the findings of the transportation analysis do not suggest a measurable increase in transportation-related accidents.

4.12.3.5.2 Law Enforcement

A growth in population, which could occur to some extent in the SESA, could cause proportionate increases in crime. As mentioned earlier, 16 of the anticipated 160 employees and their families would relocate to the area specifically for employment at the mine. Such a slight increase in population across the SESA would not likely cause an increase in crimes. County and municipal law enforcement agencies would likely be able to accommodate the slight population growth projected under the Proposed Action.

With a slight increase in ADT along the transportation routes, there may be a potential need for increased traffic enforcement; however, it is not likely that an increase in current staffing conditions would be necessary because an increase in traffic does not assume an increase in traffic violations. Furthermore, the LOS of C or better estimated to be maintained on all transportation routes would not require increases in law enforcement.

4.12.3.5.3 Fire Protection

The fire department in the Town of Alton, the nine fire departments in Kane County, and the efforts of the BLM would provide adequate firefighting capabilities on the tract as a result of coal mining operations. Given the relatively small amount of acres impacted in the SESA (1,993 acres) and increase in ADT, it is assumed that aforementioned agencies could accommodate any increase in fires resulting from mining operations.

4.12.3.5.4 Health Care and Ambulance

The hospitals in the SESA would be able to handle the slight population growth and potential for acute traumas. As stated in Section 3.12.3.4, each county has a hospital that provides 24-hour emergency care. Air transport through Air-Med or Life Flight would provide emergency service to out-of-area hospitals.

4.12.3.5.5 Explosives

Under the Proposed Action, there could be a potential need for the use of explosives in the tract. Blasting activities could have adverse impacts on existing structures in the town of Alton. The potential damage to buildings would depend on the location of the explosive use and the condition of the structures in the town. However, a blasting plan would not be completed until the successful bidder has been awarded the contract; until then, detailed impacts from the use of explosives are unknown.

4.12.3.5.6 Underground Coal Fires

Under the Proposed Action, there is a potential risk for underground coal fires. In the event of an underground coal fire, potential impacts could include an increase in health and safety issues from toxic fumes, surface fires, subsidence, and damage to infrastructure such as roads, power lines, and buildings. Section 4.6.3.4, Geology, describes the risk of underground fires for the Alton Coal Tract.

4.12.3.6 ENVIRONMENTAL JUSTICE

The following communities in the SESA were identified as EJ communities because their poverty levels exceed that of their reference county:

- Communities of Panguitch, Cedar City, and Alton
- Census tract 3 in Garfield County
- Census tracts 1103, 1004, 1005, 1106, and 1107.02 in Iron County
- Census tract 1301 in Kane County

Census tract 3 and Panguitch (in Garfield County) were identified as EJ communities because they have minority population percentages of African American, American Indian and Alaska Native, and Asian/Pacific Islander groups that exceed the county levels. Iron County had multiple minority populations exceed county levels in both Cedar City and Summit, in addition to the following census tracts: 1103, 1004, 1005, 1106, 1107.01 and 1107.02 (see Tables 3.12.15 and 3.12.16). In the town of Alton, all minority group population percentages except African Americans exceeded Kane County levels.

Potential adverse impacts to the health, safety, and welfare of a potential EJ population are examined by looking for adverse impacts to resources that affect health and welfare. Under the Proposed Action, resources that could have impacts that could directly or indirectly affect the health and welfare of poverty or minority populations in the SESA are aesthetics, air quality, climate change, cultural resources, fire management, hazardous materials and hazardous and solid waste, land use and access, livestock grazing, recreation, socioeconomics, water resources, transportation, and wildlife and special status species.

As stated in Section 4.3, adverse air quality impacts would likely occur in Kane County in the town of Alton (however, air quality analyses only show modeled noncompliance with NAAQS [PM_{10}] under Alternative C). No adverse air quality impacts would be anticipated in Iron County or Garfield County; therefore, poverty or minority populations would not be impacted in these counties.

Census tract 1103 contains the rail loadout location and was identified as an EJ community because of its poverty level (31.5%) as compared to Iron County proper (20.7%). In addition, its minority population of American Indian and Alaska Native at 1.6% exceeded that of Iron County (1.2%). The closest community (unnamed) within census tract 1103 to the rail loadout is approximately 4.5 miles (7.2 km) west of the loadout. No adverse air quality impacts are anticipated in census tract 1103 because it is located in Iron County; therefore, poverty or minority populations would not be affected. Noise levels at the unnamed community west of the rail loadout are expected to reach a maximum of approximately 35 dBA, well below regulatory thresholds and likely below ambient background noise; therefore, poverty and minority populations would not be affected in this area.

The transportation analysis in Section 4.14.3 identifies a potential 4% increase in ADT on US-89 through Hatch and Panguitch and a 2% increase on SR-56 through Cedar City. A traffic study conducted by Fehr & Peers (2013) shows that LOS C or better would be maintained on all road segments and intersections of the reasonably foreseeable coal haul transportation route (see Section 3.14 for definitions of LOS levels). Given the slight increase in ADT and the limited congestion as reflected in the expected LOS levels, adverse impacts to EJ communities are not likely. Although it is plausible to consider that an increase in traffic on any given roadway would increase the potential risk for an accident, the findings of the transportation analysis do not suggest a measurable increase in transportation-related accidents. The increases in ambient noise levels from the 4% and 2% increase in truck traffic could result in increased annoyance but would not increase the risk for measurable hearing loss. Although poverty or minority populations living along the reasonably foreseeable transportation route in the SESA may be annoyed by increases in noise from truck traffic, they would not experience a disproportionate increase in ambient noise levels when compared to nonminority populations living along the route. The water quality analysis in Section 4.16 indicates that there would be no adverse impacts to the drinking water supply in the SESA; therefore, there would be no potential for disproportionate impacts to EJ communities living in the SESA. The impacts to general public health and safety (transportation, law enforcement, health care, etc.) for all individuals in the SESA would be negligible under the Proposed Action. Therefore, adverse impacts to EJ communities would also be negligible.

Table 4.12.8 displays information concerning whether or not there are adverse impacts and disproportionate adverse impacts to EJ communities by resource.

Table 4.12.8. Potential Environmental Justice Impacts of the All Action Alternatives

Resources	Adverse Impact to EJ Communities?	Disproportionate Impact to EJ Communities?
Aesthetic resources: soundscape	Yes	Yes. Noise and vibration impacts to the town of Alton would be greater than those at other communities in the SESA and would be above regulatory thresholds for noise and blasting under certain alternatives. Proposed Action (mining on Blocks NW, C, and S): While mining in Block NW, noise impacts to the town of Alton from mining on the tract and mine-related traffic would exceed regulatory thresholds for human annoyance. While mining on Blocks C and S, noise impacts to the town of Alton from mine-related traffic would exceed regulatory thresholds for human annoyance. See Section 4.2.2.2.1. Both noise and vibration impacts from blasting conducted in Block NW to the closest identified building in the town of Alton would be well in excess of both vibration and noise regulatory thresholds and any persons in the building may experience noise levels in excess of human comfort and regulatory threshold levels. See Section 4.2.2.2.2. Alternative C (mining on Blocks C and S): While mining in Blocks C and S, noise impacts to the town of Alton from mine-related traffic would exceed regulatory thresholds for human annoyance. See Section 4.2.2.2.1. Additionally, noise and vibration impacts from blasting in Blocks C and S could exceed regulatory thresholds for human annoyance, but not the threshold for building damage. See Section 4.2.2.2.2. Alternative K1 (mining on Block C): While mining in Block C, noise impacts to the town of Alton from mine-related traffic would exceed regulatory thresholds for human annoyance. See Section 4.2.2.2.1. Additionally, noise and vibration impacts from blasting in Block C could exceed regulatory thresholds for human annoyance, but not the threshold for building damage. See Section 4.2.2.2.2.
Aesthetic resources: visual	Yes	Yes. Visual impacts to the town of Alton would be greater than those at other communities in the SESA under the Proposed Action. Proposed Action (mining on Blocks NW, C, and S): Mining and construction of related facilities would noticeably change the landscape and would change the existing character of the landscape as viewed from the town of Alton in the short term but would be reclaimed upon completion. Alternative C (mining on Blocks C and S): Surface-mining activities would remain apparent on the landscape, but would occur over less acreage than the Proposed Action and at a greater distance from the town of Alton. Alternative K1 (mining on Block C): Surface-mining activities would remain apparent on the landscape, but would occur over less acreage than the Proposed Action and at a greater distance from the town of Alton.
Aesthetic resources: night sky	Yes	No. Impacts to night sky would not be disproportionate to local or EJ communities. Impacts would be felt by all individuals and would not be specific to EJ communities. Portable lights used for mining in pits adjacent to the town of Alton may impact residents by glare from direct lighting. Glare would be reduced through the use of directional lighting and by installing shields on lights. Glare would also be reduced by placing portable lights in the pit disturbance using the change in terrain resulting from mining activity to block any potential direct lighting on the town of Alton.

Table 4.12.8. Potential Environmental Justice Impacts of the All Action Alternatives

Resources	Adverse Impact to EJ Communities?	Disproportionate Impact to EJ Communities?
Air resources	Yes	No. Under the Proposed Action and Alternative K1, there are no modeled exceedances of NAAQS. Yes. Under Alternative C, there are modeled exceedances of the NAAQS for PM_{10}. Near-field air quality monitoring indicates that mine and transport-related pollutants would be in compliance with NAAQS for PM_{10} under the Proposed Action and AlternativeK1, but not for Alternative C. Modeled exceedances under Alternative C are off of the northwest side of the tract boundary near the boundary line. The public would only be exposed to lower concentrations of PM_{10} under this alternative, because concentrations drop off quickly further away from the tract boundary. See Section 4.3.3.1 of the SDEIS for more detail.
Climate change	Yes	No. Impacts are regional in nature, not localized to EJ communities.
Cultural resources	Yes	No. Potential for disturbance to tribal-sensitive areas could affect the natural character of previously undisturbed areas through visual and auditory intrusions as well as through an increased risk of the physical disturbance of sites. However, impacts would be mitigated through the tribal consultation process and the PA.
Fire management	Yes	No. Impacts from increased risk of human-caused wildfires from construction activities in undisturbed vegetation on and adjacent to the tract and from increased traffic along the reasonably foreseeable haul route would be felt by all individuals and communities in the SESA and would not be localized to EJ communities. In addition, the Western Utah RWPP does not consider the town of Alton as a state-identified community at risk of wildfire.
Geology and minerals	No. Impacts limited to the tract	–
Hazardous materials and hazardous and solid waste	Yes	No. Impacts from increased risk of hazardous waste spills as a result of mining and haul activities would be felt by all individuals and communities on the reasonably foreseeable haul route and would not be localized to EJ communities.
Land use and access	Yes.	No. The temporary loss of lands that are zoned for activities such as agriculture, grazing, and recreation would be felt by all individuals, not those specific to EJ communities.
Livestock grazing	Yes	No. There is no indication that the 2,392–3,220 AUMs lost over the life of the mine and reclamation period as a result of the action alternatives are disproportionately operated by members of EJ communities.

Table 4.12.8. Potential Environmental Justice Impacts of the All Action Alternatives

Resources	Adverse Impact to EJ Communities?	Disproportionate Impact to EJ Communities?
Paleontology	No. Impacts limited to the tract	–
Recreation	Yes	No. Impacts to recreation would not be disproportionate to local or EJ communities. Impacts would be felt by all individuals who recreate and would not be specific to EJ communities.
Socioeconomics	Yes	No. As royalty revenues are dispersed to counties, the local communities would likely see beneficial economic impacts. Adverse impacts to population and employment would not likely disproportionately impact EJ communities. The workforce required to mine (100 employees) and transport (60 employees) coal would likely already reside in existing rural communities, and given the proximity to services, would not impact more rural EJ communities' population and/or housing situation. The Proposed Action could result in direct and indirect jobs for members of EJ communities, thus having a beneficial impact on EJ community employment opportunities. Adverse impacts to housing values, if they were to occur, could disproportionately impact the town of Alton. That said, the analysis is not clear that adverse impacts to housing values would occur in Alton or elsewhere in the SESA as a result of the Proposed Action or its alternatives. The alteration of the existing rural, quiet nature of the town of Alton and surrounding areas due to truck traffic, noise, and artificial lighting would occur over the life of the mine, but these impacts would be felt by all communities on the reasonably foreseeable coal haul route in the SESA, not just EJ communities. In addition, the natural, rural landscape would be restored gradually as the vegetation is restored by concurrent reclamation over the life of the mine.
Soils	No. Impacts limited to the tract	–
Transportation	Yes	No. Increases in project-related vehicle traffic would go directly through the EJ community of Alton, but would not result in a change in LOS. Under the Proposed Action, traffic conditions at intersections and along road segments of the reasonably foreseeable coal haul transportation route would continue to operate at their current, acceptable LOS-C or better. A traffic study conducted demonstrates that LOS-C or better would be maintained on all road segments and intersections of the reasonably foreseeable coal haul transportation route (Fehr & Peers Transportation Consultants 2013). Capacity for additional traffic would remain, and increased traffic volume would not result in reductions in LOS or reach a level of significance. In addition, transportation impacts would be felt by all communities on the reasonably foreseeable coal haul route in the SESA, not just EJ communities.
Vegetation	No. Impacts limited to the tract and the KFO road relocation. Vegetation is expected to improve with the selected seed mix and removal of noxious weeds. Noxious weeds are not expected to be spread outside of the tract due to design features.	–

Table 4.12.8. Potential Environmental Justice Impacts of the All Action Alternatives

Resources	Adverse Impact to EJ Communities?	Disproportionate Impact to EJ Communities?
Water resources	Yes	No. The action alternatives would not impact community drinking water supplies; therefore, water quality in EJ communities would not be disproportionately impacted. With regard to water quantity, the action alternatives would require withdrawal from public water supplies, but water purchases are publicly available to all water users.
Wildlife and special status species	Yes	No. Loss of wildlife habitat and movement corridors are not directly connected to EJ populations because they are not dependent on wildlife per se.

4.12.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Under Alternative C, approximately 37.8 million tons of coal would be mined over a 21-year period. As under the Proposed Action, 1.8 million tons of coal would be mined annually, and 160 employees would be required to complete mining operations. Alternative C would also require an identical amount of truck round-trips to move coal from the tract to the reasonably foreseeable coal loadout location west of Cedar City. The tract, as modified under Alternative C, would encompass approximately 3,178 acres consisting of 2,280 acres of BLM-administered land (federal surface and subsurface and 893 acres of private land (private surface and federal subsurface. The life of the mine under Alternative C would be 21 years, four fewer years than under the Proposed Action. When compared to the No Action Alternative, Alternative C would result in an increase in employment, personal income, and government revenues. A slight increase in population is anticipated, but would not lead to an increased need for public services. Under the No Action Alternative, no mining would occur and therefore an increase in local employment, income, and government revenues as a result of mining would not occur. Under Alternative C, a slight decrease in grazing revenues would be lost as a result of a decrease in AUMs and any recreation-related economic contributions from individuals who choose to recreate on the tract would be foregone under Alternative C.

4.12.4.1 EMPLOYMENT AND INCOME

Employment requirements (for direct and indirect jobs) under Alternative C would be identical to the Proposed Action, though employment at the mine would be required for 21 years under Alternative C. The annual total wages generated (from direct and indirect jobs) would be the same under Alternative C as under the Proposed Action.

4.12.4.2 GOVERNMENT AND PUBLIC FINANCE

Under Alternative C, an estimated 1.8 million tons of coal would be mined each year. Over the 21-year mine life, approximately 37.8 million tons of recoverable coal would be mined. Using the same spot price as under the Proposed Action ($32.00 per short ton), the annual recovery value would be identical to the Proposed Action at approximately $57.6 million (1.8 million tons of coal × $32.00). Over the 21-year mine life, recovery values would be approximately $1.21 billion (1.8 million tons × $32.00 × 21 years). This is a 16% decrease in potential recovery value compared to the Proposed Action.

4.12.4.2.1 Federal Royalties

Under Alternative C, annual royalties paid to the federal government would be similar to those paid under the Proposed Action because the amount of coal mined each year would be similar. However, royalty revenues would be generated for 21 years, four fewer years than the Proposed Action. When compared to the Proposed Action, Alternative C would produce 16% less royalty revenue. Assuming the annual recovery value for the coal produced under the Proposed Action would be $57.6 million per year, $7.2 million in royalties would be paid to ONRR ($57,600,000 × 0.125) and the State of Utah would receive approximately $3.6 million (approximately 1/2) per year. Under Alternative C, $151.2 million in royalties would be paid to ONRR and $75.6 million would be disbursed to the State of Utah over a 21-year period (see Table 4.12.3 for more detail).

Under Alternative C, 118 AUMs allocated to livestock grazing would be lost annually. This loss of AUMs would total 2,852 over the life of the mine. Access under Alternative C would be restricted for 31 years (21-year mine life plus 10-year reclamation period) instead of the 35 years under the Proposed Action and 26 years under Alternative K1. The 2013 value of an AUM (grazing fee), according to the

BLM (2013a) is $1.35. Thus, over the 21-year mine life, this would result in a $4,938.30 (or $159.30 annually) decrease in contributions to the BLM. Should livestock permittees need to decrease livestock numbers as a result of the decrease in AUMs, this could result in lost revenue for permittees and a potential decrease in the workforce required to manage the livestock. However, with annual rotations in the tract over the life of the mine, adverse impacts to permittees would be minimized.

4.12.4.2.2 Additional Taxes and Fees

Under Alternative C, approximately 16% fewer coal mine-related taxes and fees would be generated. Contributions to the Black Lung Excise Tax would be between $20.8 million over the 21-year mine life, and Abandoned mine land fees would be between $5.7 million. Ad valorem taxes generated over the life of the mine would be 16% less than the Proposed Action. The sales and use tax generation on goods and services associated with the mine would taper off four years earlier under Alternative C.

Bonus bid payments: Approximately $11.3–$17.0 million would be paid in bonus bid payments under Alternative C, given that 37.8 million tons of coal are expected to be mined over a 21-year period. Of the total bonus bid payment, 50% ($5.7–$8.5 million) would be disbursed to the State of Utah.

4.12.4.3 POPULATION AND HOUSING

Impacts to population and housing under Alternative C would be nearly identical to impacts under the Proposed Action. However, because the duration of the mining activities would be 21 years under Alternative C, the 10% of the 160 employees (16 individuals) that would relocate to the tract for mine employment may choose to move away from the area once the mining operations are complete. Thus, the results would be a negligible decrease in population and an increase in housing availability.

4.12.4.3.1 Property Values

Potential property value impacts to residential plots and homes in the town of Alton would be reduced under Alternative C, because this alternative eliminates Block NW from mining (the block closest to the town of Alton). Under this alternative, the closest mining activities to the town of Alton would occur in Block C (see Map 2.2), the edge of which is approximately 1 mile from the south edge of Alton's municipal boundary. All of the parcels zoned municipal in Alton are within 3 miles of Block C. Given that the life of the mine would be four years shorter under Alternative C, reclamation would begin earlier, and adverse impacts to property values would be mitigated sooner than under the Proposed Action.

4.12.4.4 TOURISM

Both action alternatives would result in the same types of impacts to recreational resources. However, Alternative C would result in fewer acres of recreation-related impact based on the smaller acreage of the tract and fewer years of impact based on the shortened life of the mine. Big game hunting areas in the PPMA would be reduced by 0.3%. Hunting in the Alton CWMU would continue, and the same amount of big game permits would be issued as in years past. Approximately 1,985 acres (4.5 %) of the Alton CWMU (approximately 43,658 acres) would be directly affected by the Alternative C. Because no big game kills have occurred in the proposed tract in the last 20 years and the tract does not fall within prime CWMU deer or elk habitat, adverse impacts to hunters who use the CWMU are not anticipated. OHV users would not be able to access 13 miles of designated routes on the tract. It is unlikely that these slight reductions in availability would deter these types of recreationists to the area. Economic contributions from these user groups would likely remain similar to current conditions given the amount of nearby lands available for big game hunting and OHV use. See Section 4.11.4 for further detail on impacts to recreation resources under this alternative.

Impacts to tourists and tourism-related businesses under Alternative C would be similar to the Proposed Action. Under Alternative C, the alteration of the existing rural, quiet nature of the town of Alton and surrounding areas due to truck traffic, noise, and artificial lighting would occur at the same level as the Proposed Action, but would end four years earlier.

4.12.4.5 PUBLIC HEALTH AND SAFETY

Under Alternative C, impacts to public health and safety would be identical to the Proposed Action. However, the duration of impacts and need for services would be four fewer years.

4.12.4.6 ENVIRONMENTAL JUSTICE

Under Alternative C, the disproportionate impacts to the town of Alton identified in Table 4.12.8 (Air Quality, Noise and Visual impacts) would be reduced because this alternative eliminates Block NW from mining (the mining block closest to the town of Alton). Under this alternative, the closest mining activities to the town of Alton would occur in Block C (see Map 2.2), the edge of which is approximately 1 mile from the south edge of Alton's municipal boundary.

Under Alternative C, mining would take place 1 mile further from the town of Alton, the life of the mine would be four years shorter, the tract would be modified to exclude 321 acres closest to Alton, and reclamation would begin earlier. As a result, disproportionate adverse impacts to the town of Alton as described in Table 4.12.8 would be minimized when compared to the Proposed Action. Under Alternative C, there are modeled exceedances of the NAAQS for PM_{10} off the northwest side of the tract boundary near the boundary line of the town of Alton (see Section 4.3.3.1). While mining in Blocks C under Alternative C, noise impacts to the town of Alton from mine-related traffic would exceed regulatory thresholds for human annoyance. See Sections 4.2.2.2.1 and 4.2.2.3.1. Additionally, noise and vibration impacts from blasting in Blocks C could exceed regulatory thresholds for human annoyance, but not the threshold for building damage. See Sections 4.2.2.2.2 and 4.2.2.3.2. In terms of visual impacts, surface-mining activities would remain apparent on the landscape, but would be eliminated on 321 acres closest to the town of Alton when compared to the Proposed Action.

4.12.5 Alternative K1: Reduced Tract Acreage

Under Alternative K1, approximately 30 million tons of coal would be mined over a 16-year period. As under the Proposed Action, 1.8 million tons of coal would be mined annually, and 160 employees would be required to complete mining operations. Alternative K1 would also require an identical amount of truck round-trips to move coal from the tract to the reasonably foreseeable coal loadout location west of Cedar City. The life of the mine under Alternative K1 would be 16 years, nine fewer years than under the Proposed Action. When compared to the No Action Alternative, Alternative K1 would result in an increase in employment, personal income, and government revenues. A slight increase in population is anticipated, but would not lead to an increased need for public services. Under the No Action Alternative, no mining would occur, and therefore an increase in local employment, income, and government revenues as a result of mining would not occur. Under Alternative K1, a slight decrease in grazing revenues would be lost as a result of a decrease in AUMs, and any recreation-related economic contributions from individuals who choose to recreate on the tract would be foregone under Alternative K1.

4.12.5.1 EMPLOYMENT AND INCOME

Employment requirements (for direct and indirect jobs) under Alternative K1 would be identical to the Proposed Action, though employment at the mine would be required for 16 years under Alternative K1. The annual total wages generated (from direct and indirect jobs) would be the same under Alternative K1 as under the Proposed Action.

4.12.5.2 GOVERNMENT AND PUBLIC FINANCE

Under Alternative K1, an estimated 1.8 million tons of coal would be mined each year. Over the 16-year mine life, approximately 30 million tons of recoverable coal would be mined. Using the same spot price as under the Proposed Action ($32.00 per short ton), the annual recovery value would be identical to the Proposed Action at approximately $57.6 million (1.8 million tons of coal × 32.00). Over the 16-year mine life, recovery values would be approximately $921.6 million (1.8 million tons × 32.00 × 16 years). This is a 36% decrease in potential recovery value compared to the Proposed Action.

4.12.5.2.1 Federal Royalties

Under Alternative K1, annual royalties paid to the federal government would be similar to those paid under the Proposed Action, because the amount of coal mined each year would be similar. However, royalty revenues would be generated for 16 years, nine fewer years than the Proposed Action. When compared to the Proposed Action, Alternative K1 would produce 36% less royalty revenue. Assuming the annual recovery value for the coal produced under the Proposed Action would be $57.6 million per year, $7.2 million in royalties would be paid to ONRR ($57,600,000 × 0.125), and the State of Utah would receive approximately $3.6 million (approximately 1/2) per year. Under Alternative K1, $115.20 million in royalties would be paid to ONRR and $57.60 million would be disbursed to the State of Utah over a 16-year period (see Table 4.12.3 for more detail).

Under Alternative K1, 92 AUMs allocated to livestock grazing would be lost annually. This loss of AUMs would total 1,472 AUMs over the life of the mine. Access under Alternative K1 would be restricted for 26 years (16-year mine life plus 10-year reclamation period) instead of 35 years under the Proposed Action and 31 years under Alternative C. The 2013 value of an AUM, according to the BLM (2013a), is $1.35. Thus, over the 16-year mine life plus the 10-year reclamation period, this would result in a $3,229.20 (or $ 124.20 annually) decrease in contributions to the BLM. Should livestock permittees need to decrease livestock numbers as a result of the decrease in AUMs, this could result in lost revenue for permittees and a potential decrease in the workforce required to manage the livestock. However, with annual rotations in the tract over the life of the mine, adverse impacts to permittees would be minimized.

4.12.5.2.2 Additional Taxes and Fees

Under Alternative K1, approximately 36% fewer coal mine-related taxes and fees would be generated. Contributions to the Black Lung Excise Tax would be $15.8 million over the 16-year mine life, and abandoned mine land fees would be $4.3 million. Ad valorem taxes generated over the life of the mine would be 36% less than the Proposed Action. The sales and use tax generation on goods and services associated with the mine would taper off nine years earlier under Alternative K1.

Bonus bid payments: Approximately $9 to $13.5 million would be paid in bonus bid payments under Alternative K1, given that 30 million tons of coal are expected to be mined over a 16-year period. Of the total bonus bid payment, 50% ($4.5 to $6.8 million) would be disbursed to the State of Utah.

4.12.5.3 POPULATION AND HOUSING

Impacts to population and housing under Alternative K1 would be nearly identical to impacts under the Proposed Action. However, because the duration of the mining activities would be 16 years under Alternative K1, the 10% of the 160 employees (16 individuals) that would relocate to the tract for mine employment may choose to move away from the area once the mining operations are complete. Thus, the results would be a negligible decrease in population and an increase in housing availability.

4.12.5.3.1 Property Values

Potential property value impacts to the town of Alton would be reduced under Alternative K1, because this alternative eliminates Block NW from mining (the mining block closest to the town of Alton). Under this alternative, the closest mining activities to the town of Alton would occur in Block C (see Map 2.3), the edge of which is approximately 1 mile from the south edge of Alton's municipal boundary. All of the parcels zoned municipal in Alton are within 3 miles of Block C. Given that the life of the mine would be nine years shorter under Alternative K1, reclamation would begin earlier, and adverse impacts to property values would be mitigated sooner than under the Proposed Action.

4.12.5.4 TOURISM

All action alternatives would result in the same types of impacts to recreational resources. However, Alternative K1 would result in fewer acres of recreation-related impacts based on the smaller acreage of the tract and fewer years of impact (16 years) based on the shortened life of the mine. Big game hunting areas in the PPMA would be reduced by 0.2%. Impacts to hunting in the Alton CWMU would be the same as those described for Alternative C, but would occur for five fewer years. OHV users would not be able to access 13 miles of designated routes on the tract. It is unlikely that these slight reductions in availability would deter these types of recreationists to the area. Economic contributions from these user groups would likely remain similar to current conditions given the amount of nearby lands available for big game hunting and OHV use. See Section 4.11.5 for further detail on impacts to recreation resources under this alternative.

Impacts to tourists and tourism-related businesses under Alternative K1 would be similar to the Proposed Action. Under Alternative K1, the alteration of the existing rural, quiet nature of the town of Alton and surrounding areas due to truck traffic, noise, and artificial lighting would occur at the same level as the Proposed Action, but would end nine years earlier.

4.12.5.5 PUBLIC HEALTH AND SAFETY

Under Alternative K1, impacts to public health and safety would be identical to the Proposed Action. However, the duration of impacts and need for services would be nine fewer years.

4.12.5.6 ENVIRONMENTAL JUSTICE

Under Alternative K1, the EJ disproportionate impacts to the town of Alton identified in Table 4.12.8 (Air Quality, Noise and Visual impacts) would be reduced because this alternative eliminates Block NW from mining (the mining block closest to the town of Alton). Under this alternative, the closest mining activities to the town of Alton would occur in Block C (see Map 2.3), the edge of which is approximately 1 mile from the south edge of Alton's municipal boundary.

Under Alternative K1, mining would take place 1 mile further from the town of Alton, the life of the mine would be nine years shorter, the tract would be modified to exclude 745 acres (including 321 acres closest to Alton), and reclamation would begin earlier. As a result, disproportionate adverse impacts to the town of Alton as described in Table 4.12.8 would be minimized when compared to the Proposed Action. In contrast to Alternative C, under Alternative K1, mine and transport-related pollutants are modeled to be in compliance with NAAQS for PM_{10} in the town of Alton (see Section 4.3.3.1). Noise and blasting impacts to the town of Alton under Alternative K1 would be the same as for Alternative C. In terms of visual impacts, surface-mining activities would remain apparent on the landscape, but would be eliminated on 745 acres (including 321 acres closest to Alton) when compared to the Proposed Action.

4.12.6 Potential Mitigation Measures

No potential mitigation measures have been identified for socioeconomic resources. See Section 4.2.5 for a discussion of potential noise- and visual-related mitigation measures that could reduce disproportioned impacts to EJ communities.

4.12.7 Unavoidable Adverse Impacts

Given that natural resource development is finite and based on demand, the SESA is susceptible to a boom-and-bust cycle. Although the proposed development would temporarily have positive impacts on the local economy with regard to revenue generation, the depletion of the resource would result in a long-term adverse impact to the economy. Those who had been dependent on the jobs and revenue provided by the mining operation would be adversely impacted as a result of job and revenue loss following resource depletion.

4.12.8 Short-term Uses versus Long-term Productivity

Increases in the workforce would contribute to temporary increases in income, housing, and service requirements. The increase in employment and revenues resulting from the mining operation would have short-term benefits for the local communities. However, once mining is complete, local revenues would be reduced and jobs would be eliminated or redirected. Once the tract has been rehabilitated, AUMs could return to current levels and recreation opportunities could be restored. The revenues and employment from those land uses would be realized indefinitely, or as long as the land uses were permitted to exist.

4.12.9 Irreversible and Irretrievable Commitments of Resources

The extraction of coal would result in a permanent (irreversible) loss of a portion of our natural resources. The irreversible loss of the resource would preclude future potential revenues for local, state, and federal governments and the local communities.

Implementation of the Proposed Action or Alternative C could reduce recreational tourism and livestock grazing and associated revenues. Social well-being and feelings of community satisfaction could also be disrupted during the life of the mine. However, studies in natural resource communities have observed that disruptive social effects do not last once the mining operations have ceased and the stability of the community has been reestablished (BLM 2008e). In addition, if structural damage occurs to buildings in the town of Alton due to vibration impacts (see Section 4.2 and Appendix L), property value impacts to these buildings could be permanent.

4.13 Soils

4.13.1 Regulatory Framework

Numerous federal and state regulations shape the management of soils as a natural resource. Regulations that pertain to soils and potential impacts from mining and other land uses include, but are not limited to the following:

- The Taylor Grazing Act of 1934, as amended, provides for continued study of erosion and flood control, and provides for any work that may be necessary to protect and rehabilitate public lands to prevent soil deterioration.
- FLPMA requires that public lands be managed in a manner that will protect scientific, environmental, air and atmospheric, and water resource values. It also requires land use plans to comply with applicable pollution control laws, including state and federal air, water, and other pollution standards.
- The Utah Coal Mine Permitting Requirements for soils (UAC R645-301-200) include, but are not limited to, the following:
  - Development of an operation plan for removing, storing, and reclaiming soils
  - Development of a reclamation plan for redistributing and reclaiming of soils
  - Protection and stabilization of all exposed surface areas to control erosion and air pollution (fugitive dust)
  - Salvage of soils suitable to support plant growth for use in reclamation
  - Protection of soil stockpiles from contaminants, disturbance, compaction, and erosion

In addition to the aforementioned regulations, the BLM uses trends or changes in vascular plants (NRCS ecological sites) and soils conditions (rangeland health) to guide the management of biological soil crusts.

BLM's Rangeland Health: Fundamentals and Standards (43 CFR 4180.1), in addition to promoting ecosystem health, specifically require that "soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform" and "upland soils exhibit permeability and infiltration rates that sustain or improve site productivity."

Management actions adopted in the KFO RMP would also be incorporated into the lease as required actions in the event of a lease sale for the tract. The KFO RMP lists the following management actions applicable to soils:

- Implement BMPs designed to minimize impacts on soils from ground-disturbing activities, as appropriate.
- Reduce soil loss on watersheds by performing appropriate land treatments.
- Initiate reclamation of surface disturbances, where appropriate, during or upon completion of the authorized project.
- Identify areas of "fragile soils" during preparation of project-level plans, as well as necessary mitigation measures to minimize risks and degradation.
- Develop and implement site-specific restrictions and/or mitigations for activities proposed in fragile soil areas on a case-by-case basis. Surface-disturbing activities must be approved by the BLM before construction and maintenance is authorized.
- Incorporate BMPs and soil protection measures into developments on sensitive soils. Measures to stabilize soils and minimize surface-water runoff would be required for slopes greater than 15%, both during tract activities and following tract completion.
- When feasible, identify and salvage biological crusts prior to disturbance; use salvaged soil crusts to inoculate reclaimed soils.

4.13.2 Alternative A: No Action

Under the No Action Alternative, no impacts to soils would occur as a result of mining activities. Some soil impacts associated with current surface uses, including livestock grazing, vegetation treatments, and OHV use, would continue. These impacts would generally be relatively minor in both extent and severity in comparison to the disturbances associated with surface mining under the action alternatives. These impacts would include erosion (related soil exposure) and compaction due to existing land uses. Under current uses, soil disturbance is generally limited to surface uses by livestock and light-duty vehicles, and heavy machinery is not a typical use. In addition, uses are generally limited to designated routes or grazing areas, rather than large swatches of major disturbance, as would occur under the action alternatives. Thus, in comparison to the action alternatives, impacts would be of lesser aerial extent and far lesser magnitude and severity. Impacts to sensitive soils would occur proportionally to the prevalence of the soils on the tract, as described in Chapter 3. However, these impacts would generally be minor and limited to surface disturbance and compaction by livestock and light-duty vehicles, and thus would not result in the need for major reclamation projects. Therefore, sensitive soils would unlikely limit reclamation success.

4.13.3 Alternative B: Proposed Action

4.13.3.1 TYPES AND NATURE OF IMPACTS TO SOILS

Under the Proposed Action, 1,993 acres of soils would be directly disturbed by surface mining and by the construction of related facilities and roads. Of this total, 1,750 acres of soil resources would be disturbed by surface mining, and 243 acres would be disturbed by other related activities, including the construction of centralized and dispersed facilities, the relocation and construction of roads, and the grading of road ROWs. Impacts under the Proposed Action would be considerably greater than under the No Action Alternative due to the large-scale removal and replacement of soils that would occur during proposed surface-mining operations (which would not occur under the No Action Alternative). Impacts to soils from current land uses on the tract from vegetation treatments, livestock grazing, and recreation would be discontinued under the Proposed Action. They would resume 35 years after mining commences (25 years for the life of the mine and 10 years for reclamation and rehabilitation).

Surface-mining activities under the Proposed Action would drastically disturb soil texture, structure, and porosity through the large-scale removal, stockpiling, and replacement of soils during surface mining. A total of 1,750 acres of soils would be removed to their full depth where surface mining takes place, and topsoil and suitable subsoil would be stockpiled for reclamation. Following the completion of mining, mined areas would be backfilled and regraded, then topped with the stockpiled soils. This would result in reclaimed soils with different long-term physical, structural, biological, and chemical properties than those present prior to surface mining. Post-mining soils would be more uniform in thickness, structure, type, texture, nutrient availability, and chemistry. The existing soil structure would largely be eliminated by the removal and replacement of soils in areas that are surface mined. In addition, changes in bulk density would occur due to mixing, aeration, and compaction. The bulk density of the entire soil profile would likely be reduced, as demonstrated by evidence that replaced soils in surface mines typically expand by approximately 15%–35% (Pfleider 1968). However, grading and compaction of topsoil would likely increase the bulk density of near-surface soils. Surface-mining impacts are referred to as “pit” impacts in this section’s tables.

Surface-mining activities would directly remove and stockpile up to 120 acres of soil per year. Topsoil would be stockpiled only until the overburden is moved to the next pit. Each of these up to 120-acre blocks would be replaced within a year, and the loss of soil productivity and increased potential for erosion related to soil removal and replacement would be short term. However, the drastic disturbance (impact) caused by removing and replacing soils, as described above, would be long term. Revegetation and natural weathering would eventually reform new soil structures with the reclaimed soils, although this would be a long-term process (hundreds of years) in the arid environment present in the tract. Per State of Utah and OSM regulation, reclaimed surface soils would be free of acid-forming soils, sodic zones, or toxic materials. They would also have a rooting zone sufficient to establish an effective and permanent vegetative cover. Thus, the long-term fertility of the soils would not be affected.

Impacts to soil resources within the 243 acres of other related activities would generally be less drastic than in areas that are surface mined. The construction of roads and facilities in these areas would result in soils being covered by infrastructure, graded or mixed, moved, compacted, or otherwise disturbed. These soils would generally not be disturbed to as great a depth, would retain more of their original qualities, and would be less uniform following reclamation. However, most of these impacts (caused by facilities, some roads, etc.) would be long-term impacts, persisting for the life of the tract.

Where the near-surface soil is compacted during disturbance and/or reclamation, its infiltration capacity would be temporarily decreased, resulting in a greater potential for runoff and erosion. Numerous erosion control measures and reclamation measures would be employed per state and federal regulation, as detailed in Chapter 2. Specifically, reclaimed areas would be required (UAC R645-301-200) to use best available technology to prevent sedimentation. They would also be required to stabilize all exposed surfaces to effectively control erosion, and stabilize rilled (or eroded) areas where post-mining land use, vegetation, or water quality would be threatened. Because temporary erosion controls specified on unreclaimed areas often prevent erosion from traveling long distances rather than completely preventing erosion (e.g., silt fencing, retention basins, etc.), there would likely be some mass transfer of eroded materials downslope early in the reclamation process. This erosion would be reduced as vegetation is established, and eroded materials would generally be prevented from impairing other resources by the required controls.

The reclamation and restoration of soil structure and functioning is determined by physical, chemical, and biological factors. As described in the above paragraphs, both disturbance and reclamation alter soil structure through compaction and the resulting loss of porosity and biological activity. These structural changes can potentially diminish the movement of water into and through the soil (Stolt et al. 2001), reduce seed and spore viability, and prevent the establishment and growth of vegetation and biological soil crusts and associated soil microbes (Scoles-Sciulla et al. 2009).

Successful reclamation of soil structure and ecological function is assumed, provided that the management practices prescribed per UAC R645-301-200 are successfully implemented. However, ecological factors outside of human control, such as drought and other short-term climatic variations, can limit the effectiveness of soil reclamation efforts. There is limited information on reclamation success for arid west soils, but published studies clearly indicate that below-average precipitation during the restoration period can impede or delay the successful restoration of soils and associated vegetation (Romney et al. 1987; Bainbridge et al. 1999; Bainbridge et al. 1995; Bainbridge 1990).

Chemical suppressants and watering may be used to reduce fugitive dust from unpaved roads and disturbed areas under the Proposed Action and action alternatives. Dust suppressants may cause dissolution of some soil constituents. In soils from arid regions, which may have high salt content, water used as a suppressant can mobilize the salts and increase the salt concentration in nearby water bodies or groundwater. In more complex situations, the chemical constituents of the suppressant can react with and leach toxic components from the soils at the application site. The issue of leaching is particularly relevant at sites that may contain hazardous material, such as coal fields, landfills, and mine tailing piles (EPA and UNLV 2004). In addition, soil microorganisms may biotransform the suppressants into benign or more toxic compounds depending on the environmental conditions at the site of application (EPA and UNLV 2004).

The application of dust suppressants can have secondary effects on the characteristics of soils, including a decrease of surface permeability. Depending on precipitation, the change in surface permeability can lead to increased runoff, decreased soil moisture, and changes in patterns of erosion on and off the application site (EPA and UNLV 2004). Specific concerns have not been identified by experts on the use of dust suppressants due to the high amount of variability associated with site conditions, dust suppressant composition, and application techniques. The determination of whether a problem might exist in any given case must be based on the assessment of site-specific conditions (EPA and UNLV 2004).

There is also a potential for soils to be affected along the approximately 110-mile reasonably foreseeable coal haul transportation route. Road dust, coal dust, and exhaust from coal hauling would add to the road dust and exhaust from existing traffic along the reasonably foreseeable coal haul transportation route. It is assumed that the effects from this road dust, coal dust, and exhaust would occur within a 100-foot buffer around the reasonably foreseeable coal haul transportation route. The deposition of road dust, coal dust, and vehicle exhaust can affect the chemical composition and productivity of soils within this buffer over time. However, it is assumed that all coal trucks would be covered or otherwise contained, preventing coal dust from escaping. There is also a risk of spills along the reasonably foreseeable coal haul transportation route from potential coal truck accidents, which also presents a risk to soils along the route.

Under the Proposed Action, and all other action alternatives, Block Sa (186.2 acres) would not be mined and the lessee would apply pre-mining vegetation treatments to the block. The proposed vegetation treatments would involve removal of pinyon-juniper, which would allow perennial grasses and forbs to return to the block, adding stability to the soil layers and reducing upland erosion.

4.13.3.2 IMPACTS TO SENSITIVE SOILS

4.13.3.2.1 Water-erosive Soils

Under the Proposed Action, 368 acres of highly erosive soils and an additional 1,483 acres of moderately erosive soils would be disturbed. Together, 93% of all soil disturbances under this alternative would take place in highly or moderately erosive soils (Table 4.13.1). Most of this disturbance would occur in areas that are surface mined. The disturbances under this alternative would likely result in substantial erosion, particularly during the period following mining but prior to reclamation. Required erosion control measures would effectively mitigate the impacts of erosion on water bodies and other resources, but would likely not prevent short-term erosion over short distances. This could result in some rilling (formation of shallow linear erosional features on the soil surface by water) and varied soil depths in areas where erosion would occur, contributing to limited reclamation success by limiting the soil depth available to vegetation in some areas, and impacting other vegetation through sedimentation. In addition, accelerated erosion could contribute to excess sedimentation in streams (e.g., Kanab Creek or Robinson Creek), and stock ponds, and could affect the stability of slopes that are planted for reclamation purposes.

4.13.3.2.2 Drought-intolerant Soils

A total of 330 acres of highly drought-intolerant soils would be disturbed under the Proposed Action (Table 4.13.2). An additional 26 acres of moderately intolerant soils would be disturbed. Of the 356 acres of total disturbance in these soils, 295 acres would be disturbed in the surface mine pit. Overall, 18% of all soil disturbance under the Proposed Action would occur in highly or moderately drought-intolerant soils, and 15% of all disturbance would be associated with surface-mining removal and replacement of these soils. Any disturbance of drought-intolerant soils would require the reclamation of those areas, which would be at an increased risk of poor reclamation success due to low available water capacity. In addition, the need to reclaim areas with droughty soils that are disturbed would likely prolong the reclamation period.

Table 4.13.1. Acres of Highly and Moderately Water-erosive Soils Impacted under each Alternative (and percentage of the total disturbance under each alternative)

Disturbance Type	Alternative A* (No Action)	Alternative B (Proposed Action)†	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)‡	Alternative K1 (Reduced Tract Acreage)¥
Highly Erosive				
Pit disturbance	0	322.3 (16.2%)	315.8 (19.0%)	237.1 (23.4%)
Other disturbance§	0	46.1 (2.3%)	41.4 (2.5%)	16.9 (1.7%)
Total disturbance	**0**	**368.4 (18.5%)**	**357.2 (21.5%)**	**254.0 (25.1%)**
Moderately Erosive				
Pit disturbance	0	1,288.6 (64.7%)	1,124.1 (67.6%)	619.8 (61.2%)
Other disturbance	0	194.1 (9.7%)	166.3 (10.0%)	126.5 (12.5%)
Total disturbance	**0**	**1,482.7 (74.4%)**	**1,290.4 (77.6%)**	**746.3 (73.7%)**
Sum of Highly and Moderately Erosive				
Pit disturbance	0	1,610.9 (80.8%)	1,439.9 (86.6%)	856.8 (84.7%)
Other disturbance	0	240.2 (12.1%)	207.7 (12.5%)	143.4 (14.2%)
Total disturbance	**0**	**1,851.1 (92.9%)**	**1,647.6 (99.1%)**	**1,000.2 (98.8%)**

* Although there would be no impact to soils related to mining under the No Action Alternative, impacts to soils due to other current land uses (grazing and vegetation treatments) would continue.

† 1,993 acres total soil disturbance.

‡ 1,662 acres total soil disturbance.

¥ 1,012 acres total soil disturbance.

§ "Other" disturbances include centralized and dispersed facilities and roads with their adjoining ROWs.

Table 4.13.2. Acres of Highly and Moderately Drought-intolerant Soils Impacted under each Alternative (and percentage of the total disturbance under each alternative)

Disturbance Type	Alternative A* (No Action)	Alternative B (Proposed Action)†	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)‡	Alternative K1 (Reduced Tract Acreage)¥
Highly Droughty				
Pit disturbance	0	291.0 (14.6%)	291.0 (17.5%)	212.2 (21.0%)
Other disturbance§	0	39.0 (2.0%)	36.8 (2.2%)	16.6 (1.6%)
Total disturbance	**0**	**330.0 (16.6%)**	**327.8 (19.7%)**	**228.8 (22.6%)**
Moderately Droughty				
Pit disturbance	0	3.8 (0.2%)	3.8 (0.2%)	3.8 (0.4%)
Other disturbance	0	22.1 (1.1%)	18.4 (1.1%)	21.5 (2.1%)
Total disturbance	**0**	**25.9 (1.3%)**	**22.2 (1.3%)**	**25.3 (2.5%)**
Sum of Highly and Moderately Droughty				
Pit disturbance	0	294.8 (14.8%)	294.8 (17.7%)	216.0 (21.3%)
Other disturbance	0	61.2 (3.1%)	55.2 (3.3%)	38.1 (3.8%)
Total disturbance	**0**	**356.0 (17.9%)**	**349.9 (21.1%)**	**254.1 (25.1%)**

* Although there would be no impact to soils related to mining under the No Action Alternative, impacts to soils due to other current land uses would continue.
† 1,993 acres total soil disturbance.
‡ 1,662 acres total soil disturbance.
¥ 1,012 acres total soil disturbance.
§ "Other" disturbances include centralized and dispersed facilities and roads with their adjoining ROWs.

4.13.3.2.3 Saline Soils

No highly or moderately saline soils would be disturbed under any of the alternatives. Therefore, there would be a relatively low risk of poor reclamation success due to excess salinity in the soils, or due to increases in salinity in downstream waters as a result of soil disturbance.

4.13.3.2.4 Sodic Soils

A total of 1.4 acres of highly sodic soils would be disturbed under the Proposed Action (Table 4.13.3). This disturbance would take place exclusively in the surface-mining pit, and would represent approximately 0.07% of the total soil disturbance under this alternative. Because OSM rules restrict the use of sodic soils for reclamation, the disturbed areas would be reclaimed with less sodic soils, which would likely improve growing conditions for most vegetation. High sodium levels in soils affect reclamation potential by inhibiting the establishment of vegetation in disturbed areas. Thus, where sodic soils are used, reclamation success would have an increased risk of failure or delayed success of vegetation establishment. Areas with sodic soils that are reclaimed could also require different seed mixes and species in order to be successfully reclaimed. Therefore, the disturbance of sodic soils would result in either an increased risk of impeded reclamation or would require their burial, which would in turn reduce the depth of topsoil for use elsewhere for reclamation (as discussed under Shallow Soils, below).

Table 4.13.3. Acres of Highly and Moderately Sodic Soils Impacted Under Each Alternative (and percentage of the total disturbance under each alternative)

Disturbance Type	Alternative A* (No Action)	Alternative B (Proposed Action)†	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)‡	Alternative K1 (Reduced Tract Acreage)¥
Highly Sodic				
Pit disturbance	0	1.4 (0.07%)	1.4 (0.08%)	1.4 (0.1%)
Other disturbance§	0	0 (0%)	0 (0%)	0 (0%)
Total disturbance	**0**	**1.4 (0.07%)**	**1.4 (0.08%)**	**1.4 (0.1%)**
Moderately Sodic				
Pit disturbance	0	0 (0%)	0 (0%)	2.5 (0.3%)
Other disturbance	0	0 (0%)	0 (0%)	0 (0%)
Total disturbance	**0**	**0 (0%)**	**0 (0%)**	**2.5 (0.3%)**
Sum of Highly and Moderately Sodic				
Pit disturbance	0	1.4 (0.07%)	1.4 (0.08%)	3.9 (0.4%)
Other disturbance	0	0 (0%)	0 (0%)	0 (0%)
Total disturbance	**0**	**1.4 (0.07%)**	**1.4 (0.08%)**	**3.9 (0.4%)**

* Although there would be no impact to soils related to mining under the No Action Alternative, impacts to soils due to other current land uses would continue.

† 1,993 acres total soil disturbance.

‡ 1,662 acres total soil disturbance.

¥ 1,012 acres total soil disturbance.

§ "Other" disturbances include centralized and dispersed facilities and roads with their adjoining ROWs.

4.13.3.2.5 Shallow Soils

Almost all of the soil disturbance under the Proposed Action would occur in areas where the soil's A horizon is less than 20 inches deep, or where the soil is at a high or moderate risk of limited reclamation due to its shallow depth (Table 4.13.4). Approximately 75% of all disturbance would occur in areas with less than a 10-inch-deep A horizon. The considerable disturbance of shallow soils under this alternative would limit the depth of topsoil that could be used for reclamation, and would increase the reliance on subsoils in the rooting zone during reclamation. The use of shallow topsoil and subsoil during reclamation would increase the risk of inhibited restoration potential due to limited water holding capacity and nutrient availability during plant establishment.

Table 4.13.4. Acres of Highly and Moderately Shallow Soils Impacted Under Each Alternative (and percentage of the total disturbance under each alternative)

Disturbance Type	Alternative A* (No Action)	Alternative B (Proposed Action)†	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)‡	Alternative K1 (Reduced Tract Acreage)¥
Highly Shallow				
Pit disturbance	0	1,285.9 (64.5%)	1,177.8 (70.9%)	653.6 (64.6%)
Other disturbance§	0	213.0 (10.7%)	184.8 (11.1%)	121.5 (12.0%)
Total disturbance	**0**	**1,498.9 (75.2%)**	**1,362.6 (82.0%)**	**775.1 (76.6%)**
Moderately Shallow				
Pit disturbance	0	452.0 (22.7%)	276.3 (16.6%)	215.1 (21.3%)
Other disturbance	0	29.4 (1.5%)	23.1 (1.4%)	21.9 (2.2%)
Total disturbance	**0**	**481.4 (24.2%)**	**299.4 (18.0%)**	**237.0 (23.4%)**
Sum of Highly and Moderately Shallow				
Pit disturbance	0	1,737.9 (87.2%)	1,454.1 (87.5%)	868.7 (85.8%)
Other disturbance	0	242.4 (12.2%)	207.9 (12.5%)	143.4 (14.2%)
Total disturbance	**0**	**1,980.3 (99.4%)**	**1,662.0 (100%)**	**1,012.1 (100%)**

* Although there would be no impact to soils related to mining under the No Action Alternative, impacts to soils due to other current land uses would continue.

† 1,993 acres total soil disturbance.

‡ 1,662 acres total soil disturbance.

¥ 1,012 acres total soil disturbance.

§ "Other" disturbances include centralized and dispersed facilities and roads with their adjoining ROWs.

4.13.3.2.6 Alkaline Soils

No highly alkaline soils would be disturbed under any alternative. Under the Proposed Action, 316 acres of moderately alkaline soils would be disturbed, primarily in the surface-mining pit (Table 4.13.5). Alkaline soils limit plant establishment during reclamation, and their disturbance under this alternative would result in either an increased risk of impeded reclamation or would require their burial, which would in turn reduce the depth of topsoil for use elsewhere for reclamation (as discussed under Shallow Soils, above).

Table 4.13.5. Acres of Highly and Moderately Alkaline Soils Impacted Under Each Alternative (and percentage of the total disturbance under each alternative)

Disturbance Type	Alternative A* (No Action)	Alternative B (Proposed Action)†	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)‡	Alternative K1 (Reduced Tract Acreage)¥
Moderately Alkaline				
Pit disturbance	0	295.4 (14.8%)	228.7 (13.8%)	184.4 (18.2%)
Other disturbance§	0	20.8 (1.0%)	17.6 (1.1%)	15.2 (1.5%)
Total disturbance	**0**	**316.2 (15.9%)**	**246.3 (14.8%)**	**199.7 (19.7%)**

* Although there would be no impact to soils related to mining under the No Action Alternative, impacts to soils due to other current land uses would continue.

† 1,993 acres total soil disturbance.

‡ 1,662 acres total soil disturbance.

¥ 1,012 acres total soil disturbance.

§ "Other" disturbances include centralized and dispersed facilities and roads with their adjoining ROWs.

4.13.3.2.7 Biological Soil Crusts

Biological soils crusts are found on various soil surfaces throughout the analysis area, though no data on the prevalence of biological soil crust are available for the tract. Because the amount of biological soil crusts cannot be quantified, impacts are discussed qualitatively.

Biological soil crusts in the analysis area are mostly cyanobacteria (*Microcoleus*) and nitrogen-fixing lichens (*Collema*) (BLM 2001a). It is likely that these cyanobacteria and nitrogen-fixing lichens are limited and sparse in the analysis area due to its relatively high average elevations and relatively dense vascular plant cover. Total crust cover (cyanobacterial, moss, and lichen) is typically high where elevations are low (and low where elevations are high) (BLM 2001a). Total crust cover is usually inversely related to vascular plant cover, because less plant cover results in more surfaces available for colonization and growth of crustal organisms (Belnap et al. 2001). Within the 1,993 acres of predicted surface disturbance where biological soils are not identified beforehand, existing soils crusts would be adversely impacted by surface-disturbing activities. The crusts could be removed entirely and buried or disrupted to the point of nonfunctionality. Burial generally results in a greatly simplified crustal community and disturbance flattens pinnacled and rolling crusts, thus decreasing water infiltration and increasing runoff (Belnap et al. 2001).

Soil crusts are thought to improve the moisture capacity of soils, stabilize them against erosion, enhance soil nutrients, and discourage the growth of some types of annual weeds. Thus, their disturbance would reduce the moisture capacity, nutrient availability, and erosion resistance of the disturbed areas' soils. This would therefore reduce the soils' productivity, fertility for vascular plants, and reduce reclamation success. At this time, the success of reclamation measures is poorly understood for the tract; therefore, impacts from the disturbance of soil crust would likely persist as long-term impacts. However, when feasible, crusts would be identified and preserved, and efforts would be made to inoculate newly replaced topsoil with biological soil crust spores.

4.13.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

4.13.4.1 TYPES AND NATURE OF IMPACTS TO SOILS

Under Alternative C, 1,662 acres of soils would be disturbed by surface mining and the construction of related facilities and roads. Of this total, 1,454 acres of soil resources would be disturbed by surface mining, and 207 acres would be disturbed by related activities, including the construction of centralized and dispersed facilities, the relocation and construction of roads, and the grading of road ROWs. Impacts under Alternative C would be of the same type in nature as under Proposed Action, and they would (similarly) be considerably greater than under the No Action Alternative. Impacts to soils from current land uses on the tract from vegetation treatments, livestock grazing, and recreation would be discontinued under Alternative C and would resume 31 years after mine-related activities begin (21 years for the life of the mine and 10 years for reclamation and rehabilitation).

4.13.4.2 IMPACTS TO SENSITIVE SOILS

4.13.4.2.1 Water-erosive Soils

Under Alternative C, 357 acres of highly erosive soils and an additional 1,290 acres of moderately erosive soils would be disturbed. Together, 99% of all soil disturbances under this alternative would take place in highly or moderately erosive soils (see Table 4.13.1). This is slightly less disturbance of erosive soils than would take place under the Proposed Action. Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.4.2.2 Drought-intolerant Soils

A total of 328 acres of highly drought-intolerant soils would be disturbed under Alternative C (see Table 4.13.2). An additional 22 acres of moderately drought-intolerant soils would be disturbed. This is slightly less disturbance of drought-intolerant soils than would take place under the Proposed Action. Of the 350 acres of total disturbance in these soils, 295 acres would be disturbed in the surface-mining pit. Overall, 21% of all soil disturbance under Alternative C would occur in highly or moderately drought-intolerant soils; 18% of all disturbance would be associated with surface-mining removal and replacement of these soils. Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.4.2.3 Saline Soils

No highly or moderately saline soils would be disturbed under any of the alternatives. Therefore, there would be a relatively low risk of poor reclamation success due to excess salinity in the soils, or to increases in salinity in downstream waters as a result of soil disturbance.

4.13.4.2.4 Sodic Soils

Impacts under Alternative C would be the same as described for the Proposed Action, except that the disturbance would represent approximately 0.08% (rather than 0.07% with the Proposed Action) of the total soil disturbance under this alternative.

4.13.4.2.5 Shallow Soils

All of the soil disturbance under Alternative C would occur in areas where the soil's A horizon is less than 20 inches deep, or where the soil is at a high or moderate risk of limited reclamation due to its shallow depth (slightly more than the Proposed Action) (see Table 4.13.4). Under Alternative C, approximately 82% of all disturbance would occur in areas with less than a 10-inch-deep A horizon. Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.4.2.6 Alkaline Soils

No highly alkaline soils would be disturbed under any alternative. Under Alternative C, 246 acres of moderately alkaline soils would be disturbed, primarily in the surface-mining pit (slightly less than under the Proposed Action; see Table 4.13.5). Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.4.2.7 Biological Soil Crusts

Impacts would be of the same nature as described for the Proposed Action, except that 331 fewer acres of predicted surface disturbance would occur under Alternative C.

4.13.5 Alternative K1: Reduced Tract Acreage

4.13.5.1 TYPES AND NATURE OF IMPACTS TO SOILS

Under Alternative K1, 1,012 acres of soils would be disturbed by surface mining and the construction of related facilities and roads. Of this total, 869 acres of soil resources would be disturbed by surface mining and 144 acres would be disturbed by other related activities, including the construction of centralized and dispersed facilities, the relocation and construction of roads, and the grading of road ROWs. Impacts under Alternative K1 would be of the same type and nature as under Proposed Action, and they would (similarly) be considerably greater than under the No Action Alternative. Impacts to soils from current tract land uses from vegetation treatments, livestock grazing, and recreation would be discontinued under Alternative K1 and resume 35 years after mine-related activities begin (25 years for the life of the mine and 10 years for reclamation and rehabilitation).

4.13.5.2 IMPACTS TO SENSITIVE SOILS

4.13.5.2.1 Water-erosive Soils

Under Alternative K1, 254 acres of highly erosive soils and an additional 746 acres of moderately erosive soils would be disturbed. Together, 99% of all soil disturbances under this alternative would take place in highly or moderately erosive soils (see Table 4.13.1). This is fewer total acres of disturbance of erosive soils than would take place under the Proposed Action. Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.5.2.2 Drought-intolerant Soils

In all, 229 acres of highly drought-intolerant soils would be disturbed and an additional 25 acres of moderately drought-intolerant soils would be disturbed under Alternative K1. This is less than the total acres of drought-intolerant soils impacted under the Proposed Action (see Table 4.13.2). Of the 254 acres of total disturbance in these soils under Alternative K1, 216 acres would be disturbed in the surface-mining pit. Overall, 25% of all soil disturbance would occur in highly or moderately drought-intolerant soils and 21% of all disturbance would be associated with surface-mining removal and replacement of these soils. Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.5.2.3 Saline Soils

No highly or moderately saline soils would be disturbed under Alternative K1 or the other action alternatives. Therefore, there would be a relatively low risk of poor reclamation success due to excess salinity in the soils or to increases in salinity in downstream waters as a result of soil disturbance.

4.13.5.2.4 Sodic Soils

Impacts under Alternative K1 would be the same as described for the Proposed Action, except that 2.5 acres of moderately sodic soils would also be disturbed (in addition to 1.4 acres of highly sodic soils). This is more than twice the total acres of disturbance of highly and moderately sodic soils under the Proposed Action. All of the 3.9 acres of total disturbance in highly and moderately sodic soils under Alternative K1 would occur in the surface-mining pit (see Table 4.13.3). Overall, 0.4% of all soil disturbance would occur in highly or moderately sodic soils.

4.13.5.2.5 Shallow Soils

All of the soil disturbance under Alternative K1 would occur in areas where the soil's A horizon is less than 20 inches deep, or where the soil is at a high or moderate risk of limited reclamation due to its shallow depth (slightly more than under the Proposed Action; see Table 4.13.4). Under Alternative K1, approximately 77% of all disturbance would occur in areas with less than a 10-inch-deep A horizon. Impacts would be of the same nature as described for Proposed Action in all other respects.

4.13.5.2.6 Alkaline Soils

No highly alkaline soils would be disturbed under Alternative K1 or the other action alternatives. Under Alternative K1, 200 acres of moderately alkaline soils would be disturbed, primarily in the surface-mining pit (less than under the Proposed Action; see Table 4.13.5). Impacts would be of the same nature as described for the Proposed Action in all other respects.

4.13.5.2.7 Biological Soil Crusts

Impacts would be of the same nature as described for the Proposed Action, except that 981 fewer acres of predicted surface disturbance would occur under Alternative K1.

4.13.6 Potential Mitigation Measures

Potential mitigation measures to reduce impacts to soil resources could include the following:

- Whenever feasible, direct haul topsoil to areas currently being reclaimed to retain viable biological components of the soil (seeds, root fragments and rhizomes, soil microbes).
- Identify and map rocky outcrops prior to disturbance; replace rocky outcrops with rock or rocky subsoil rather than topsoil to increase habitat diversity and increase the depth of topsoil available for reclamation elsewhere.

4.13.7 Unavoidable Adverse Impacts

Under the Proposed Action, Alternative C, and Alternative K1, the physical, structural, biological, and chemical properties of soils disturbed by surface mining would be unavoidably impacted. Post-mining soils would be far more uniform in thickness, structure, type, texture, nutrient availability, and chemistry. The existing soil structure would largely be eliminated by the removal and replacement of soils in areas that are surface mined. In addition, changes in bulk density would occur due to mixing, aeration, and compaction. In areas where sensitive soils are disturbed, their use in reclamation would limit the success of reclamation due to increased erosion, limited water holding capacity, high pH, or high sodium content. These soil attributes would limit the establishment of vegetation relative to areas without sensitive soils.

Successful reclamation of soil structure and ecological function is assumed provided that reclamation practices are successfully implemented. Nevertheless, drought and other ecological factors outside of human control can limit the effectiveness of soil reclamation efforts by limiting soil productivity or increasing the time required for soil recovery.

4.13.8 Short-term Uses versus Long-term Productivity

The short-term removal and replacement of soils in areas that are surface mined would result in long-term changes in the productivity of soils under the Proposed Action, Alternative C, and Alternative K1. Soil productivity following mining and reclamation would be far less diverse and far more uniform. Soils capable of limiting productivity (i.e., sodic, acid-producing, droughty) that are currently present on the tract would be buried or mixed into other soils. Therefore, post-mining productivity may be slightly higher, but would also reduce the productivity of highly productive areas and reduce the prevalence of less productive areas. Some productivity would be lost due to the removal of soil structure and changes in soil properties. Despite the slight loss in productivity, the soil would still be able to support rangeland plants (native and suitable non-native species). The productivity of soils impacted by other mine-related activities (dispersed and centralized facilities, roads, and ROWs) would be eliminated or reduced during the life of the mine (up to 25 years depending on the alternative). Soil productivity in areas that are only disturbed at their surface, or that are covered by facilities (that are eventually removed), would largely be restored once those facilities were removed because the severity of impact would be minor relative to areas that are surface mined.

4.13.9 Irreversible and Irretrievable Commitments of Resources

Under the Proposed Action, Alternative C, and Alternative K1, the physical, structural, biological, and chemical properties of soils that are removed for surface mining would be irreversibly altered (because it may take hundreds of years to reform). The productivity of soils impacted by other mine-related activities (dispersed and centralized facilities, roads, and ROWs) would be irretrievably removed or reduced until reclamation is completed at the tract’s termination.

4.14 Transportation

The analysis of impacts to transportation near the tract is an assessment of the changes in LOS caused by the Proposed Action and alternatives. LOS is a measure of the quality of service on transportation infrastructure and generally indicates the level of traffic congestion. LOS on two-lane highways is a reflection of traffic flow conditions, average speed, and time spent following other vehicles. Three different alternatives are analyzed in this section. Each alternative considers different tract sizes and duration of operations. LOS is rated on a scale of A (the best) to F (the worst). Table 4.14.1 provides a description of LOS A–F (Fehr & Peers Transportation Consultants 2013). The coal haul transportation route that is used for analysis purposes is the most reasonably foreseeable route, but it is impossible to predict the exact route that a successful bidder might choose.

Table 4.14.1. Intersection Level of Service Descriptions

LOS	Description of Traffic Conditions
A	Free Flow/Insignificant Delay Extremely favorable progression. Individual users are virtually unaffected by others in the traffic stream.
B	Stable Operations/Minimum Delays Good progression. The presence of other users in the traffic stream becomes noticeable.
C	Stable Operations/Acceptable Delays Fair progression. The operation of individual users is affected by interactions with others in the traffic stream.
D	Approaching Unstable Flows/Tolerable Delays Marginal progression. Operating conditions are noticeably more constrained.
E	Unstable Operations/Significant Delays Can Occur Poor progression. Operating conditions are at or near capacity.
F	Forced Flows/Unpredictable Flows/Excessive Delays Unacceptable progression with forced or breakdown of operating conditions.

Source: Fehr & Peers (2013).

4.14.1 Regulatory Framework

Coal haul trucks operating in the tract would be within the weight and size limitations established by the UDOT’s Motor Carrier Division. There are also no regulations concerning the volume of coal haul trucks allowed on tract-associated roadways. Therefore, the weight and size of trucks as well as truck volume are not components of the analysis.

4.14.2 Alternative A: No Action

Under the No Action Alternative, ACD’s application to lease the coal included in the Alton Coal Tract would not be approved, and the coal included in the tract would not be mined. Roads along the reasonably foreseeable coal haul transportation route would continue to operate under their current LOS. Peak-hour LOS projected for 2020 under the No Action Alternative would continue to have low delays per vehicle and little to no congestion (Fehr & Peers Transportation Consultants 2013). Changes to LOS would not reach a level of significance. Under the No Action Alternative, coal haul trucks would use the reasonably foreseeable coal haul transportation route to deliver coal from the Coal Hollow Mine (private mining area) to the rail loadout at Iron Springs. This activity would occur for the life of the Coal Hollow Mine (approximately 2–3 years).

Continued increases in population in Iron County, largely in and near the Cedar City area (as indicated in Section 3.12) could increase LOS on certain roads over time, regardless of mining activity.

4.14.3 Alternative B: Proposed Action

Under the Proposed Action, workers would commute from their homes to the tract according to the normal operating hours. Service operations would include delivery of diesel fuel and machine and equipment parts (daily or weekly), servicing of portable toilets (weekly or biweekly), servicing of permanent toilet facilities (monthly or bimonthly), removal of waste oil (weekly or biweekly), and incidental trips such as delivery of office supplies (biweekly or monthly), as necessary. Up to 100 workers would be employed at the tract. Although the traffic study completed by Fehr & Peers (2013) does not include projections of mine employee traffic, it is assumed that these employees would commute individually to the mine from communities within a one-hour to two-hour radius of the tract, resulting in an estimated 100 round-trips per day to and from the tract. Because of the proximity of the communities of Panguitch and Hatch to the tract, it is assumed that most of the commuter traffic would occur on US-89. The additional commuter traffic along US-89 would represent a 5% increase in ADT. Based on service and operations needs, it is estimated that no more than 20 service trips per week or an average of four round-trips per day to the tract would occur. This would be a 0.1% increase in ADT along US-89. Commuter traffic and service trips would represent a minimal contribution to traffic levels and would not result in any changes to LOS.

The following actions under the Proposed Action would result in impacts to LOS.

- An estimated 153 truck round-trips per day would occur to and from the tract and along the reasonably foreseeable loadout location.
- Mine production operations could occur 24 hours a day, seven days a week for the 25-year life of the mine.[7]

The reasonably foreseeable coal haul transportation route ADT on US-89 through Hatch and Panguitch is currently 3,600–4,100 vehicles per day. The additional coal truck traffic would represent a 4% increase in overall ADT through Hatch and Panguitch when compared to the No Action Alternative. When compared with existing heavy truck traffic on US-89 through Hatch and Panguitch, the additional coal truck traffic would represent a 33% increase over current heavy truck traffic. The ADT on SR-56 through Cedar City is 8,600 (Fehr & Peers Transportation Consultants 2013). The additional coal truck traffic would represent a 2% increase in ADT through Cedar City when compared to the No Action Alternative. Under the Proposed Action, traffic conditions at intersections and along road segments of the reasonably foreseeable coal haul transportation route would continue to operate at their current, acceptable LOS-C or better. A traffic study conducted demonstrates that LOS-C or better would be maintained on all road segments and intersections of the reasonably foreseeable coal haul transportation route (Fehr & Peers Transportation Consultants 2013). Capacity for additional traffic would remain, and increased traffic volume would not result in reductions in LOS or reach a level of significance.

4.14.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Impacts to transportation would be the same as those described under the Proposed Action but would occur over a 21-year period.

[7] Operating hours would depend on the successful bidder; however, this EIS generally analyzes mine operations between 5 and 7 days per week, 24 hours per day. At the same time, it is also indicated throughout that ACD's plans are to operate 6 days/week (avoiding operations on Sundays).

4.14.5 Alternative K1: Reduced Tract Acreage

Impacts to transportation would be the same as those described under the Proposed Action but would occur over a 16-year period.

4.14.6 Potential Mitigation Measures

The lessee will contribute to the road maintenance on the paved segment of KFO Route 116 between Alton and US-89, other impacted county roads, and will work closely with the Kane County Road Department.

4.14.7 Unavoidable Adverse Impacts

Increase in vehicle traffic of no more than 4% in the tract and on the reasonably foreseeable coal haul transportation route would occur over time under all action alternatives; however, no unavoidable adverse impacts to LOS would result from those increases.

4.14.8 Short-term Uses versus Long-term Productivity

Because there would be an increase in vehicle traffic of no more than 4%, surface mining and infrastructure development and use during the life of the mine would not impact the short-term use or the long-term productivity of local transportation.

4.14.9 Irreversible and Irretrievable Commitments of Resources

Under all action alternatives, there would be no irreversible impacts to transportation, because transportation resources would not be permanently altered as a result of mining operations on the tract. The increase in vehicle traffic that would occur during the life of the mine would be an irretrievable impact that would dissipate once mining operations ceased.

4.15 Vegetation

This section discusses the impacts of the Proposed Action and alternatives, as described in Chapter 2, on upland, wetland, and riparian vegetation. Upland vegetation communities in the tract are pinyon-juniper woodland, mountain brush, annual and perennial grasses, rabbitbrush, sagebrush/grassland, and sagebrush/grassland (treated) communities (Section 3.15). The meadow communities in the tract are considered potential wetlands for the purpose of this analysis due to the presence of predominately hydrophytic vegetation (Section 3.15.2.4). Impacts to riparian vegetation are analyzed separately.

4.15.1 Impact Indicators, Thresholds, and Analysis Assumptions

Acres of surface disturbance in the vegetation communities are used as the primary indicator of impacts to the vegetation resource by implementation of the alternatives. This disturbance would mainly be incurred by minerals development and construction activities as planned under both action alternatives.

Acres of increased susceptibility to noxious or weedy plant species invasion are also used as an indicator of impacts to this resource. Gelbard and Belnap (2003) found that weed densities were highest in vegetation up to 14 m (average) away from paved roads, although weeds were also found in areas farther away from the roads (up to 50 m, the extent of the survey area). This is mainly from 1) weed seed transport during road construction, and subsequent vehicle traffic on roads; 2) ground disturbance during construction that creates bare soil, deeper soil, or soil with greater nutrient availability; and 3) soil compaction by construction and travel that creates conditions that favor invasive species (Gelbard et al. 2003). These factors are also similar to those that occur in other types of facilities construction and as a result of mining activities; therefore, a buffer would also be used around these areas for the purpose of this analysis. Increased susceptibility would be calculated by creating a GIS buffer of 30 m around roads, pipelines, construction areas, and surface-mined areas that would demark acres of land with an increased susceptibility to weed invasion. The 30-m buffer was chosen as a safe estimate for the likely spread of weed species; this is meant to represent 14 m with high weed occurrence (Gelbard et al. 2003) with an additional 16 m of lower weed occurrence. This model is not meant to predict the actual spread of weeds in the tract following mining operations, but illustrates that the potential for weed invasion is likely to increase in undisturbed lands adjacent to disturbance areas. Use of a buffered area around construction and mining areas would also allow for a more quantitative comparison between action alternatives. To simplify these calculations, environmental variables such as soil depth, vegetation community structure, slope, ecosystem health, and moisture availability in the surrounding areas would not be taken into consideration even though these factors do contribute to the ability of vegetation communities to withstand invasion. Data on these parameters in the tract are not currently available, and an accurate model for invasion is not feasible at this time.

A site-specific, detailed MRP would be created by the lessee in consultation with DOGM. The operation portion of the plan requires the operator to promptly establish and maintain an interim vegetative cover on disturbed areas that would not be immediately redisturbed. The reclamation portion of this plan would include specifications for grading the surface to an acceptable PMT, replacement of salvaged topsoil to an acceptable depth over suitable overburden, and reestablishment of vegetation for the determined post-mining land use. Reestablishment of vegetation would serve to mitigate some of the negative effects of surface disturbance on vegetation communities. This is discussed in the Regulatory Framework section below, as well as in the alternatives analyses. Revegetation would also increase the quality of vegetation communities over current conditions due to agency objectives for reclamation. Because there are no regulatory measures to address thresholds for impacts to non–special status species vegetation, these impacts would be addressed through BMPs, reclamation, and mitigation measures, such as the vegetation treatments outlined in the sage-grouse mitigation plan (see Section 4.18.2.1.2.3).

Consequences of increased dust due to area travel and construction is also analyzed for all action alternatives.

4.15.2 Regulatory Framework

There are numerous federal and state regulations that shape the management of vegetation resources. Regulations that pertain to vegetation and potential impacts from mining and other land uses include but are not limited to the following:

- The Taylor Grazing Act of 1934, as amended, provides for continued study of erosion and flood control, and provides for any work that may be necessary to protect and rehabilitate public lands to prevent soil deterioration.
- The ESA of 1973 protects endangered species and their habitat. This act is also used as a basis for eradicating non-native invasive species that threaten endangered species.
- The federal CWA, with amendments in 1972 and 1977, has the objective of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. The CWA of 1987 provides additional authorizations.
- Section 404 of the federal CWA requires the identification of all wetlands and waters under the jurisdiction of USACE, replacement of all jurisdictional and functional wetlands, and monitoring of reclaimed wetlands that may be impacted by proposed activities.
- The Federal Noxious Weed Act of 1974 authorizes measures to eradicate or control the spread of noxious weeds.
- FLPMA of 1976 directs managers to determine areas suitable for livestock grazing under the multiple-use, sustained-yield mandate.
- The Public Rangelands Improvement Act of 1978 provides policy to manage, maintain, and improve public rangelands to increase productivity while remaining consistent with management objectives.
- The Plant Protection Act of 2000 consolidates and modernizes all major statutes pertaining to plant protection and quarantine (e.g., the Federal Noxious Weed Act, the Plant Quarantine Act).
- The Utah Seed Act (Utah Code, Title 4, Chapter 16) provides guidelines for the labeling and distribution of seeds, in conjunction with the Seed Law (Rule R68-8), which prohibits the sale and distribution of noxious weed seeds.
- The Utah Noxious Weed Act, as amended (Utah Code, Title 3 Chapter 17), authorizes measures to eradicate or control the spread of noxious weeds.
- The Utah Noxious Weed Act (Rule R68-9) designates State of Utah noxious weeds and sources capable of weed dissemination.

Utah coal mine permitting requirements for vegetation (UAC R645-301.300) include but are not limited to the following:

- Description of the vegetative resources of the tract and potential impacts to vegetation resources adequate to predict the potential for reestablishing vegetation.
- Description of the productivity of the land before mining in the tract.
- Reclamation designed to restore and enhance vegetation resources to a condition suitable for designated post-mining land uses. Control of erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures.
- Monitoring of revegetation growth and diversity until release of final reclamation bond (after a minimum of 10 years).
- Monitoring of erosion to identify any need for corrective action during the establishment of vegetation.

The KFO RMP and other BLM documents such as the *Standards for Rangeland Health and Guidelines for Livestock Management* have provided the framework for other required mitigation measures. The following standards would be applied to vegetation resources and special status plant species:

- Using grazing exclosures and monitoring vegetation during revegetation to determine suitability for post-mining land uses
- Controlling weed infestation chemically and mechanically
- Directly hauling topsoil
- Selectively planting shrubs in riparian areas
- Planting sagebrush seedlings in addition to seeding the area with sagebrush
- Creating depressions and rock piles
- Using special planting procedures around rock piles
- Promptly establishing interim vegetative cover in disturbed areas that would not be immediately redisturbed

4.15.3 Actions that Would Cause Change to the Existing Vegetation Resource

4.15.3.1 ALTERNATIVE A: NO ACTION

Under the No Action Alternative, ACD's application to lease the coal included in the Alton Coal Tract would not be approved, the tract would not be offered for competitive lease sale, and the coal included in the tract would not be mined.

No coal mining activities or infrastructure development would occur under the No Action Alternative, and therefore no acres of vegetation communities would be disturbed. Likewise, no acres in the tract would be at an increased susceptibility to weed invasion due to actions associated with mining activities or infrastructure development.

Management of vegetation on BLM-administered lands in the tract would continue at the discretion of the BLM under the KFO RMP (BLM 2008b). Specifically, this would mean managing vegetation in the tract to improve wildlife habitat, increasing forage production for livestock grazing, providing watershed protection, and reducing soil loss. In addition to vegetation treatments and livestock grazing, other land uses such as OHV use would continue similar to current levels.

The use of vegetation management is emphasized under the KFO RMP. The management process restores sagebrush grasslands that have been invaded by pinyon-juniper woodlands for ecosystem restoration and watershed health. In the short term, vegetation treatments would increase the risk of invasion by noxious weeds and invasive species by vegetation removal and ground disturbance. Areas where vegetation treatments were not successful could be invaded by weed species and/or become infested with other undesired vegetation, which could also reduce the health of the upland communities over the long term. Implementing general treatment design features such as prescribed burning in lieu of mechanical treatment when suitable, evaluating treatment sites for soil suitability and stability prior to manipulation, and excluding livestock from all treatment areas until seedlings are established, would help facilitate reestablishment of the desired vegetation communities. Using desired species of grasses, forbs, and browse in the rehabilitation and reseeding of treated areas would facilitate vegetation reestablishment and avoid creating single-species communities.

Vegetation treatments, if successful, would have long-term benefits to the area by removing undesired species, increasing species diversity and age class of certain communities, improving vegetation composition and structure, and increasing overall vegetation cover. This would result in healthier woodlands, upland communities, and riparian areas that are more capable of retaining moisture and nutrients and resisting disease, invasive species, drought, and other natural disturbances and/or stressors.

Vegetation treatments could also improve watershed health, reduce soil loss, and enhance forage vegetation conditions. Implementing erosion control measures in fragile watershed areas would help reduce short-term impacts such as soil erosion, surface runoff, and sedimentation of water sources. These vegetation treatments would help to reestablish upland communities, maintain or improve the health of riparian/wetland communities, reestablish seedlings and understory vegetation, and retain soil moisture and nutrients in forests and woodlands (BLM 2008b).

4.15.3.2 ALTERNATIVE B: PROPOSED ACTION

Under the Proposed Action, the Alton Coal Tract would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the tract. The boundaries of the tract under the Proposed Action (see Map 1.2) would be reasonably consistent with the tract reconfiguration completed by the BLM after ACD's original LBA submittal (see Map 2.7). A total of 1,993 acres of surface disturbance (surface mining and infrastructure development) would occur in the Alton Coal Tract under the Proposed Action. However, this disturbance would not all occur at one time. There would be a single open pit (approximately 120 acres), and at any one time, there would be approximately 120 acres of open surface-mining pit disturbance and an additional 120 or more acres in some stage of reclamation.

Underground mining would occur on 613 acres of land in the tract (depending on the extent of surface mining). Though subsidence related to underground mining is not expected to impact the overlying vegetation, any adverse effects would be repaired in accordance with DOGM rules and regulations (UAC 40-10). In Utah, the effects of subsidence usually consist of surface cracks, general ground lowering, and cliff fracture or failure (Smith 2008). Under the Proposed Action, as well as all other action alternatives, Block Sa (186.2 acres) would not be mined, and the lessee would apply pre-mining vegetation treatments to the block. The proposed vegetation treatments would involve removal of pinyon-juniper from areas traditionally dominated by sagebrush/grasslands and would improve the overall health of sagebrush communities by increasing age class diversity and allowing a more open canopy for grasses, forbs, and shrubs.

4.15.3.2.1 Effects of Surface-mining Activities on Vegetation

Of the total 1,993 acres of surface disturbance that would occur in the Alton Coal Tract under the Proposed Action, 1,750 acres would be the direct result of surface-mining operations (pit disturbance). Of this total, approximately 17 acres would occur on existing roads and the remaining 1,733 acres would occur in the vegetation communities.

4.15.3.2.1.1 Upland Areas

Of the approximately 3,437 acres of vegetated land in the tract to be impacted by surface mining, approximately 1,677 (49%) would occur in upland areas. Of this total, 609 acres would be in pinyon-juniper communities, 315 acres would be in the sagebrush/grassland community, 472 acres would be in the sagebrush/grassland (treated) community, 259 acres would be in the annual and perennial grassland community, and 22 acres would be in the mountain brush community. This information is shown in Table 4.15.1.

Table 4.15.1. Acres of Upland Vegetation Communities Directly Disturbed by Surface Mining under the Proposed Action

Upland Vegetation Community	Acres Disturbed	Total Upland Acres in Tract	Percentage Disturbed by Surface Mining
Pinyon-juniper woodlands*	609.0	1,430.0	42.6%
Sagebrush/grassland	314.9	860.2	36.6%
Sagebrush/grassland (treated)	471.5	749.1	62.9%
Annual and perennial grasses	259.3	324.1	80.0%
Mountain brush	22.0	62.8	35.0%
Rabbitbrush	0.0	10.7	0.0%
Surface mining total	**1,676.7**	**3,436.9**	**48.8%**

*This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Surface mining would result in the removal of 49% of 3,437 acres of upland vegetation in the tract. These vegetation communities require long periods of time and the relative absence of invasive annual plant species (such as cheatgrass) in order to reestablish naturally. Active restoration would be needed after mining operations are complete and the land has been regraded. The reestablishment of vegetation is based on the ability of reclaimed soils to support new native and suitable non-native vegetation. See the Soils section of Chapter 4 for soils analysis.

The mountain brush community would experience an approximately 35% reduction in acreage from surface-mining disturbance. Likewise, 37% of sagebrush/grassland acres, 63% of sagebrush/grassland (treated) communities, and 43% of pinyon-juniper woodlands in the tract would also be eliminated from surface-mining activities. Revegetation efforts would focus on restoring these areas to sagebrush and grassland ecosystems to benefit watershed health, wildlife, and livestock. Because of this, a total elimination of pinyon-juniper and mountain brush community acreages in the mining footprint would be likely in the short and long term.

Because annual and perennial grasses are not considered a native vegetation community, a reduction of 80% is not necessarily considered a loss to the resource. This is especially true of annual and perennial grasses displaced by surface mining that are to be revegetated with native and non-native rangeland-suitable vegetation at the completion of mining activities.

4.15.3.2.1.2 Wetland Areas

Disturbance from surface mining is expected to impact 52.5 acres of meadow vegetation. This is approximately 84% of the total 62.8 acres of meadow vegetation in the tract. A preliminary JD was issued in November 2012, identifying the potential limits of existing wetlands, streams, and other water bodies within the tract that may be subject to the USACE’s regulatory jurisdiction under the CWA. The preliminary JD identified approximately 54 acres of wetlands (USACE 2012a). These wetlands were classified into three habitat types: approximately 18.5 acres were classified as riparian wet meadow wetlands, 31.6 acres were classified as irrigated wet meadow wetlands, and 3.8 acres were classified as mixed riparian scrub-shrub/wet meadow wetlands (Frontier Corporation USA 2012). Acres of potential disturbance in wetland areas would require avoidance, minimization, or compensatory mitigation measures as approved by the USACE in a Section 404 permit that would be granted upon review of the official wetland delineation.

Canada thistle, the only listed noxious weed currently identified in the tract, is found in the meadow community. Further disturbance in this community would lead to an increase in the spread of this species in the tract, but reclamation would use an approved seed mix without noxious weeds.

4.15.3.2.1.3 Riparian Areas

Disturbance from surface mining is expected to impact 3.8 acres of riparian vegetation. This is approximately 7% of the total 55.3 acres of riparian vegetation in the tract. Revegetation of this area at the completion of mining activities would be required, with the objective of restoring riparian communities to achieve rangeland health standards and proper functioning condition (PFC).

4.15.3.2.2 Effects of Facilities Construction Activities on Vegetation

Centralized facilities associated with mining activities on the Alton Coal Tract would be located on approximately 36 acres of BLM-administered land in the tract's no-coal zone (areas outside of pit disturbance boundaries) (see Map 1.2). Other dispersed facilities such as temporary light-use roads and haul roads, electrical poles and lines, various temporary ponds and water-control structures, temporary topsoil and overburden stockpiles, and temporary berms and screens would result in approximately 160 acres of vegetation removal, and would be sited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible. Where it is not possible to avoid disturbances to these areas, the mitigation measures described in the Regulatory Framework section above would be prescribed.

Approximately 36 acres of vegetation would be removed as a result of construction of centralized facilities. Of this total, 34.3 acres (96%) would be in the sagebrush/grassland (treated) community, and 1.4 acres (4%) would be in pinyon-juniper communities. This information is shown in Table 4.15.2.

Table 4.15.2. Acres of Upland Vegetation Communities Directly Disturbed by Construction of Centralized Facilities under the Proposed Action

Upland Vegetation Community	Acres Disturbed	Percentage Total Area Disturbed by Centralized Facility Construction
Pinyon-juniper woodlands*	1.4	4%
Sagebrush/grassland (treated)	34.3	96%
Centralized facilities construction total	**35.7**	**100**%

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Land disturbed by construction of centralized facilities would remove approximately 1% of the total 3,437 acres of upland vegetation in the tract. The 34.3 acres of disturbance in the sagebrush/grassland (treated) vegetation community is approximately 5% of its total 749 acres. The 1.4 acres of disturbance in pinyon-juniper woodlands is less than 0.001% of all the land occupied by these communities (1,430 acres). No acres of riparian or wetland vegetation would be removed by construction of centralized facilities.

A total of 160 acres would be disturbed by construction of other dispersed facilities; however, the locations of these facilities have yet to be determined. To estimate vegetation disturbance from dispersed facility construction, total potential acreage was identified by acres of no-coal zone for each vegetation community (Table 4.15.3). This acreage was capped, when applicable, to the total maximum extent of disturbance (160 acres) and provides the most conservative estimate of potential dispersed facility impacts to tract vegetation. It is assumed that only a portion of the maximum potential acreage would be disturbed for each vegetation community. Total acres of dispersed facility disturbance were apportioned across vegetation communities based on their percentage of land in the tract (see Section 3.15.2). Based on this approach, 64.3 acres (40%) would be in pinyon-juniper communities, 38.6 acres (24%) would be in sagebrush/grasslands, and 33.4 acres (21%) would be treated sagebrush/grasslands. Remaining acres of disturbance would be distributed across other vegetation communities in the tract.

Care would be taken to avoid wetland and riparian areas when selecting sites for these facilities. Assuming that all these facilities would be placed in upland areas, this would represent a loss of approximately 5% of the 3,437 acres of upland vegetation communities in the tract. When constructing dispersed facilities, riparian and meadow vegetation would be avoided where practicable.

Table 4.15.3. Acres of Vegetation Communities Potentially Disturbed by Construction of Dispersed Facilities under the Proposed Action

Vegetation Community	Maximum Potential Acres Disturbed	Estimated Acres Disturbed
Pinyon-juniper woodlands*	160	64.3
Sagebrush/grassland	160	38.6
Sagebrush/grassland (treated)	160	33.4
Mountain brush	5.8	2.9
Annual and perennial grasses	39.1	14.6
Rabbitbrush	10.1	0.5
Riparian	47.6	2.4
Meadow	10.3	2.9

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

4.15.3.2.3 Effects of Road Relocation on Vegetation

Approximately 47 acres of vegetation in the tract would be removed from surface disturbance (clearing) for the relocation of KFO Route 116 under the Proposed Action. Table 4.15.4 shows the acres of surface disturbance to each vegetation community that would occur from the relocation of the actual road surface and from the KFO Route 116 ROW.

Table 4.15.4. Acres of Vegetation Communities Directly Disturbed by Kanab Field Office Route 116 Relocation on BLM-administered Lands in the Tract under the Proposed Action

Vegetation Community	Acres Disturbed Road Surface	Acres Disturbed ROW	Total Acres in Tract	Percentage Disturbed by Road Relocation
Meadow	0.0	0.0	62.8	0%
Mountain brush	0.0	0.0	62.8	0%
Annual and perennial grasses	1.7	2.9	324.1	1.4%
Pinyon-juniper woodlands*	7.1	12.7	1,430.8	1.4%
Rabbitbrush	0.2	0.3	10.7	4.7%
Riparian	0.2	0.3	55.3	0.9%
Sagebrush/grassland	4.8	8.1	860.2	1.5%
Sagebrush/grassland (treated)	3.0	5.2	749.1	1.1%
Road relocation total	17.0	29.5	3,555.8	1.3%

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Road relocation by itself would not disturb large acreages of land in the tract. The greatest disturbance by percentage (4.7%) would occur in the sagebrush/grassland vegetation community. No disturbance from road relocation would affect the meadow or mountain brush communities.

4.15.3.2.4 Increased Risk for Weed Invasion

Because BMPs would be implemented during mining activities, it is assumed that no new weed species would be introduced to the tract. It is also assumed that BMPs would prevent the spread of weeds from the tract to the reasonably foreseeable coal haul transportation route. However, it is possible that weed species currently present in the tract could expand their ranges. This is especially likely for species such as cheatgrass that thrive in disturbance areas. Canada thistle, the only state-listed noxious weed in the tract, also tends to spread into disturbed areas (Morishita 1999). Soil and vegetation disturbance associated with mining are planned to occur in areas currently occupied by both these species under this alternative.

A 30-m buffer around all proposed roads, construction facilities, and surface mines was used to calculate the potential spread of weeds as a result of proposed activities under the Proposed Action. The results of these calculations are shown in Table 4.15.5.

Table 4.15.5. Acres of Land at Increased Risk for Weed Invasion under the Proposed Action

	Area (acres) or Length (miles)	Additional Area (acres) included in 30-m Buffer*	Total Acres at Increased Risk for Weed Invasion
Centralized facilities	35.8	9.5	45.3
Dispersed facilities	160.0	unknown	160.0 (plus unknown buffer)
KFO Route 116 relocation	17.23 (6.5 miles)	138.8	156.0
Surface mine	1,750.1	154.3	1,904.3
Total			**2,265.6**

* Some buffered areas extend outside the tract.

Mined areas, even though they are to be revegetated at the completion of activities, would still be susceptible to weed invasion. Disturbed soils are generally more susceptible to invasion (DiTomaso 2000); the soils in these areas would be repositioned and regraded and would otherwise be dissimilar to the native soils that existed pre-disturbance.

The construction and mining activities proposed under the Proposed Action would increase the acres of land susceptible to weed invasion by 2,266 acres over the No Action Alternative. This acreage includes the 30-m buffers as well as the mined and construction footprint areas.

4.15.3.2.5 Revegetation

Under the Proposed Action, recoverable portions of in-place coal reserves would be mined over approximately 25 years using surface and underground mining methods. Reclamation would be concurrent with mining over the course of the estimated 25-year mine life, and would be followed by a potential 10-year reclamation and revegetation monitoring period.

The entire 1,733 acres affected by surface mining under the Proposed Action would be revegetated. The 196 acres of vegetated land affected by centralized and dispersed facilities construction would also be revegetated as deconstruction occurs. Specific revegetation plans, including target communities for restoration, would be made by the lessee in accordance with guidance from the BLM and DOGM. Wetland revegetation plans would have to be made in accordance with USACE guidelines and mitigation requirements. General methods for revegetation are outlined in Chapter 2.

Revegetation in the mining and development footprint would change the distribution of vegetation communities. Reclamation measures proposed include an overall reduction in pinyon-juniper woodlands and an increase in sagebrush and grassland communities.

4.15.3.2.6 Other Actions

Increased traffic on highways and new roads, construction, and mining would lead to an increase in fugitive dust, which would create short-term, direct negative impacts to vegetation in all communities in the tract and surrounding area. Dust on the surface of leaves inhibits stomatal function and photosynthesis (Hirano et al. 1995), and therefore impacts overall plant health. Dust would impact vegetation in the tract and surrounding area for the life of mining operations on the tract. It is assumed that the coal haul trucks would be covered or otherwise contained, preventing coal dust from escaping and affecting vegetation along the reasonably foreseeable coal haul transportation route.

Increased O_3 pollution from the burning of fossil fuels in coal haul trucks and construction vehicles/equipment would also lead to potential impacts on vegetation communities in the tract and along the reasonably foreseeable coal haul transportation route. Ground-level O_3 causes more damage to plants than all other air pollutants combined (USDA 2012). O_3 enters plants' leaves through their stomata during normal gas exchange. Plants exposed to O_3 can exhibit symptoms such as chlorosis (yellowing of leaves due to reduced production of photosynthetic pigments) and leaf die-off. Other symptoms of O_3 exposure include flecks (irregular, light-tan spots less than 1 mm in diameter), stipples (small, darkly pigmented areas approximately 2–4 mm in diameter), bronzing, and reddening (USDA 2012). The type and severity of the symptoms depend on factors such as the duration and concentration of O_3 exposure, and the symptoms can vary from one species to another (USDA 2012). With constant daily exposure to O_3, flecking, bronzing, and reddening are gradually replaced by yellowing and loss of leaves (USDA 2012).

The effects of vegetation management would be the same in nature as those described under the No Action Alternative. However, because the sage-grouse mitigation plan (see Section 4.18.2.1.2.3) would be applied to any of the action alternatives as a design feature, the level of vegetation management would be greater under the Proposed Action than under the No Action Alternative to compensate for the greater level of surface disturbance.

4.15.3.2.7 Summary of Effects of Management Actions on Vegetation under the Proposed Action

The acres of vegetation affected by each type of surface disturbance under the Proposed Action are shown in Table 4.15.6. Acres affected by underground mining are not shown because these would not result in direct removal of vegetation at the surface.

Table 4.15.6. Acres of Each Vegetation Community to be Removed from Surface-disturbing Activities in the Alton Coal Tract under the Proposed Action

Vegetation Community	Total Acres in Tract	Acres Disturbed by:				Total Acres Removed*	Percentage Total to be Disturbed
		Surface Mining	Centralized Facilities Construction	Dispersed Facilities Construction†	KFO Route 116 Relocation		
Pinyon-juniper woodlands‡	1,430.8	609.0	1.4	64.3	19.8	694.4	48.6%
Sagebrush/grassland	860.2	314.9	0.0	38.6	12.9	366.5	42.6%
Sagebrush/grassland (treated)	749.1	471.5	34.3	33.4	8.2	547.5	73.1%
Annual and perennial grasses	324.1	259.3	0.0	14.6	4.6	278.4	85.9%
Meadow	62.8	52.5	0.0	2.9	0.0	55.5	88.3%
Mountain brush	62.8	22.0	0.0	2.9	0.0	24.9	39.6%
Riparian	55.3	3.8	0.0	2.4	0.5	6.7	12.1%
Rabbitbrush	10.7	0.0	0.0	0.5	0.5	1.0	9.2%
Total	**3,555.8**	**1,732.9**	**35.7**	**160**	**46.5**	**1,974.8**	**55.5%**

* In addition to dispersed facilities to be constructed.

† Specific placement of facilities is unknown at this time; however, acres of vegetation removal were estimated by apportioning total dispersed facility acres across vegetation communities based on their percentage of land in the tract. Additional information on this approach, as well as a more conservative estimate of total potential acreage, is discussed in Section 4.15.3.2.2.

‡ This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Within the total 3,556 acres of land in the tract currently occupied by vegetation, 1,975 acres, or 56% of these, would be removed from surface-mining and construction activities. Approximately 40% of the vegetation in the mountain brush community would be removed, approximately 88% of the vegetation in the meadow community and 86% in the annual and perennial grasses community would be removed, 49% of the vegetation in the pinyon-juniper woodlands would be removed, 73% of the vegetation in the sagebrush/grassland (treated) community would be removed, and 43% of the vegetation in the sagebrush/grassland community would be removed. Approximately 12% of vegetation in the riparian community would also be removed.

Vegetation in the tract and surrounding areas would be negatively impacted by dust from increased travel and construction activities during the life of mining operations.

All areas affected by surface mining and facilities and road construction would be revegetated at the completion of the mine activities. However, it would be assumed that revegetated areas would still be susceptible to weed invasion due to the increased nutrient availability of disturbed soils that favors invasive species colonization (Lowe et al. 2003). A 30-m buffer around these areas (see rationale in this chapter's Introduction section) leads to 2,266 acres that would become more susceptible to invasion by noxious and invasive weeds because of mining and infrastructure development activities.

4.15.3.3 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

Under Alternative C the tract would be modified to exclude Block NW (see Map 2.2). Further, certain mining activities in Block S would be subject to seasonal restrictions to reduce impacts to the local sage-grouse population. Under Alternative C, the modified tract would be offered for lease at a sealed-bid, competitive lease sale subject to standard and special lease stipulations developed for the tract. The boundaries of the modified tract would be reasonably consistent with the configuration shown in Map 2.2.

Consistent with the purpose and need for the action, the intent of Alternative C is to resolve in part or in full issues related to the local sage-grouse population, noise, and visual impacts to the town of Alton as well as issues related to conflicting land uses (agriculture versus surface mining). Alternative C may also reduce impacts to other resources such as AVF, springs and surface waters, wildlife, soils, public health and safety, paleontological resources, cultural resources, and vegetation. Potential impacts to vegetation would be the same in nature as those described under the Proposed Action (see Section 4.15.3.2), but would vary in magnitude.

4.15.3.3.1 Effects of Surface-mining Activities on Vegetation

Of the total 1,662 acres of surface disturbance that would occur in the Alton Coal Tract under Alternative C, 1,454 acres would be the direct result of surface-mining operations (pit disturbance). Of this total, 11 acres of disturbance would occur on existing roads, and the remaining 1,443 acres would occur in vegetation communities. However, this disturbance would not all occur at one time. At any one time, active and suspended (due to seasonal timing restrictions) mining operations would involve an estimated 240 acres (two pits).

4.15.3.3.2 Upland Areas

Under Alternative C, approximately 1,439 (46%) of the 3,107 acres of vegetated uplands in the tract would be disturbed by surface mining (Table 4.15.7). Of this total, 22 acres would be in mountain brush, 182 acres would be in annual and perennial grasses, 602 acres would be in pinyon-juniper communities, 162 acres would be in the sagebrush/grassland community, and 472 acres would be in the sagebrush/grassland (treated) community. Active restoration would be needed after mining operations are complete and the land has been regraded.

Table 4.15.7. Acres of Upland Vegetation Communities Directly Disturbed by Surface Mining under Alternative C

Upland Vegetation Community	Acres Disturbed	Total Acres in Tract	Percentage Disturbed by Surface Mining
Pinyon-juniper woodlands*	601.7	1,410.2	42.7%
Sagebrush/grassland (treated)	471.5	749.1	62.9%
Sagebrush/grassland	161.7	627.8	25.8%
Annual and perennial grasses	182.2	247.0	73.8%
Mountain brush	22.0	62.8	35.0%
Rabbitbrush	0.0	10.7	0.0%
Surface mining total	**1,439.1**	**3,107.1**	**46.3%**

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

The mountain brush community would experience an approximately 35% reduction in acreage from surface-mining disturbance. Likewise, approximately 26% of sagebrush/grassland acres, 63% of sagebrush/grassland (treated) communities, and 43% of pinyon-juniper woodlands in the tract would also be eliminated from surface-mining activities. Revegetation efforts would focus on restoring these areas to sagebrush and grassland ecosystems to benefit the watershed, wildlife, and livestock; and as such, a total elimination of pinyon-juniper and mountain brush community acreages in the mining footprint would be likely in the short and long term.

Because annual and perennial grasses are not considered a native vegetation community, a reduction of 74% is not considered a loss to the native vegetation resource. Impacts to annual and perennial grasses removed during surface mining and associated activities would be mitigated by reclamation and revegetation with native and non-native rangeland-suitable plants upon completion of mining activities.

4.15.3.3.2.1 Wetland Areas

Disturbance from surface mining would not impact the meadow vegetation community because the area containing the meadow vegetation community would not be included in the tract under this alternative.

4.15.3.3.2.2 Riparian Areas

Disturbance from surface mining is expected to remove 3.7 acres of riparian vegetation. This is approximately 8% of the total 54 acres of riparian vegetation in the tract. Revegetation of this area at the completion of mining activities would be required, and would lead to an increase in vegetation quality due to the requirements of rangeland health standards and agency objectives for reclamation.

4.15.3.3.3 Effects of Facilities Construction Activities on Vegetation

Centralized facilities associated with mining activities on the Alton Coal Tract would be located on approximately 36 acres of BLM-administered land in the tract’s no-coal zone (areas outside of pit disturbance boundaries) (see Map 2.2). This is the same as under the Proposed Action.

Dispersed facilities would occupy 135 acres of land in the tract. The placement of these facilities would be the same as under the Proposed Action. Although the maximum potential and estimated vegetation disturbance by vegetation community would be less due to the smaller size of the tract under this alternative (Table 4.15.8). When constructing dispersed facilities, riparian vegetation would be avoided where practicable.

Table 4.15.8. Acres of Vegetation Communities Potentially Disturbed by Construction of Dispersed Facilities under Alternative C

Vegetation Community	Maximum Potential Acres Disturbed	Estimated Acres Disturbed
Pinyon-juniper woodlands*	135	60.2
Sagebrush/grassland	135	26.8
Sagebrush/grassland (treated)	135	32.0
Mountain brush	5.8	2.7
Annual and perennial grasses	39.9	10.5
Rabbitbrush	10.2	0.5
Riparian	46.5	2.3

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Avoidance criteria would also be the same as under the Proposed Action. Assuming construction of dispersed facilities takes place in upland areas, this would be a loss of an additional 135 acres of upland vegetation, or 4% of the total 3,107 upland acres in the tract.

4.15.3.3.4 Effects of Road Relocation on Vegetation

Approximately 36 acres of vegetation on BLM-administered land in the tract would be removed from the relocation of KFO Route 116 under Alternative C (Table 4.15.9).

Table 4.15.9. Acres of Vegetation Communities Directly Disturbed by Kanab Field Office Route 116 Relocation on BLM-administered Lands in the Tract under Alternative C

Upland Vegetation Community	Acres Disturbed Road Surface	Acres Disturbed ROW	Total Acres in Tract	Percentage Disturbed by Road Relocation
Pinyon-juniper woodlands*	5.9	10.4	1,410.2	1.2%
Sagebrush/grassland (treated)	3.0	5.2	749.1	1.1%
Sagebrush/grassland	2.6	4.6	627.8	1.1%
Annual and perennial grasses	1.4	2.4	247.0	1.5%
Mountain brush	0.0	0.0	62.8	0.0%
Riparian	0.1	0.2	54.0	0.6%
Rabbitbrush	0.2	0.3	10.7	4.7%
Meadow	0.0	0.0	0.0	0.0%
Road relocation total	**13.2**	**23.1**	**3,161.6**	**1.1%**

*This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Road relocation alone would not disturb large acreages of land in the tract. The greatest disturbance by percentage (4.7%) would occur in the rabbitbrush vegetation community. No disturbance from road relocation would affect meadow or mountain brush communities. These acreages are similar to, but less than those under the Proposed Action and greater than those under Alternative K1.

4.15.3.3.5 Increased Risk for Weed Invasion

Because BMPs would be implemented during mining activities, it is assumed that no new weed species would be introduced to the tract. It is also assumed that BMPs would prevent the spread of weeds from the tract to the reasonably foreseeable coal haul transportation route. However, it is possible that weed species currently present in the tract could expand their ranges. Canada thistle, the only state-listed noxious weed in the tract, also tends to spread into disturbed areas (Morishita 1999). Soil and vegetation disturbance associated with mining are planned to occur in areas currently occupied by both these species under this alternative.

A 30-m buffer around all proposed roads, construction facilities, and surface mines was used to calculate the potential for spread of weeds as a result of proposed activities under Alternative C. The results of these calculations are shown in Table 4.15.10.

Table 4.15.10. Acres of Land at Increased Risk for Weed Invasion under Alternative C

	Area (acres) or Length (miles)	Additional Area included in 30-m Buffer*	Total Acres at Increased Risk for Weed Invasion
Centralized facilities	35.8	9.5	45.3
Dispersed facilities	135.0	unknown	135.0 (plus unknown buffer)
KFO Route 116 relocation	13.4 (4.6 miles)	108.8	122.2
Surface mine	1,454.0	130.4	1,584.4
Total			**1,886.9**

* Some buffered areas extend into the surrounding nontract area.

The construction and mining activities proposed under Alternative C would increase the acres of surface disturbance and land susceptible to weed invasion by 1,887 acres over the No Action Alternative. This includes the mining and construction footprint areas, as well as the 30-m buffers around these disturbances. Mined areas, even though they are to be revegetated at the completion of activities, would still be susceptible to weed invasion. Disturbed soils are generally more susceptible to invasion (DiTomaso 2000); the soils in these areas would be repositioned and regraded and would otherwise be dissimilar to the native soils that existed pre-disturbance.

4.15.3.3.6 Revegetation

Under Alternative C, recoverable portions of in-place coal reserves would be mined over approximately 21 years using surface and underground mining methods. Reclamation would be concurrent with mining over the course of the estimated 21-year mine life and would be followed by a minimum 10-year reclamation and revegetation monitoring period.

The entire 1,443 acres affected by surface mining under Alternative C would be revegetated. The 171 acres affected by centralized and dispersed facilities construction would also be revegetated as deconstruction occurs. Specific revegetation plans, including target communities for restoration, would be implemented by the lessee in accordance with guidance from the BLM and the DOGM. Wetland revegetation plans would have to be made in accordance with USACE guidelines and mitigation requirements. General methods for revegetation are outlined in Chapter 2.

Revegetation in the mining and development footprint would most likely change the distribution of vegetation communities; mainly as a reduction in pinyon-juniper woodlands and an increase in sagebrush and grassland communities.

4.15.3.3.7 Other Actions

Increased traffic on highways and new roads, construction, and mining would lead to an increase in fugitive dust, which would create short-term direct negative impacts to vegetation in all the communities in the tract and the surrounding area. Dust on leaf surfaces inhibits stomatal function and photosynthesis (Hirano et al. 1995) and reduces overall plant health. This effect is likely to be felt by vegetation in the tract and surrounding area for the life of the mine. It is assumed that the coal haul trucks would be covered or otherwise contained, preventing coal dust from escaping and affecting vegetation along the reasonably foreseeable coal haul transportation route.

Increased O_3 pollution from the burning of fossil fuels in coal haul trucks and construction vehicles/equipment would also lead to potential impacts on vegetation communities in the tract and along the reasonably foreseeable coal haul transportation route. Ground-level O_3 causes more damage to plants than all other air pollutants combined (USDA 2012). O_3 enters plants' leaves through their stomata during normal gas exchange. Plants exposed to O_3 can exhibit symptoms such as chlorosis (yellowing of leaves due to reduced production of photosynthetic pigments) and leaf die-off. Other symptoms of O_3 exposure include flecks (irregular, light-tan spots less than 1 mm in diameter), stipples (small, darkly pigmented areas approximately 2–4 mm in diameter), bronzing, and reddening (USDA 2012). The type and severity of the symptoms depend on factors such as the duration and concentration of O_3 exposure, and the symptoms can vary from one species to another (USDA 2012). With constant daily exposure to O_3, flecking, bronzing, and reddening are gradually replaced by yellowing and loss of leaves (USDA 2012).

The effects of vegetation management would be the same in nature as those described under the No Action Alternative. However, because the sage-grouse mitigation plan (see Section 4.18.2.1.2.3) would be applied to any of the action alternatives as a design feature, the level of vegetation management would be greater under the Alternative C than under the No Action Alternative to compensate for the greater level of surface disturbance.

4.15.3.3.8 Summary of Effects of Management Actions on Vegetation under Alternative C

The acres of vegetation affected by each type of surface disturbance are shown in Table 4.15.11. Acres affected by underground mining are not shown because they would not result in direct removal of vegetation at the surface.

Table 4.15.11. Acres of Each Vegetation Community to be Removed from Surface-disturbing Activities in the Alton Coal Tract under Alternative C

Vegetation Community	**Total Acres in Tract**	**Acres Disturbed by:**				**Total Acres Removed***	**Percentage Total to be Disturbed**
		Surface Mining	**Centralized Facilities Construction**	**Dispersed Facilities Construction**†	**KFO Route 116 Relocation**		
Meadow	0.0	0.0	0.0	0.0	0.0	0.0	0%
Mountain brush	62.8	22.0	0.0	2.7	0.0	24.7	39.3%
Annual and perennial grasses	247.0	182.2	0.0	10.5	3.8	196.5	79.6%
Pinyon-juniper woodlands‡	1,410.2	601.7	1.4	60.2	16.83	680.1	48.2%
Rabbitbrush	10.7	0.0	0.0	0.5	0.5	1.0	8.0%
Riparian	54.0	3.7	0.0	2.3	0.3	6.3	11.7%
Sagebrush/grassland	627.8	161.7	0.0	26.8	7.2	195.7	31.2%
Sagebrush/grassland (treated)	749.1	471.5	34.3	32.0	8.2	546.0	72.9%
Total	**3,161.6**	**1,442.8**	**35.7**	**135.0**	**36.8**	**1,650.38**	**52.2%**

* In addition to dispersed facilities to be constructed.

† Specific placement of facilities is unknown at this time; however, acres of vegetation removal were estimated by apportioning total dispersed facility acres across vegetation communities based on their percentage of land in the tract. Additional information on this approach, as well as a more conservative estimate of total potential acreage, is discussed in Section 4.15.3.3.3.

‡ This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Within the total 3,161 acres of land in the tract currently occupied by vegetation, 1,650 acres (52%) would be removed from surface-mining and construction activities (including 135 acres for dispersed facilities). Thirty-nine percent of the vegetation in the mountain brush community would be removed, approximately 80% of the vegetation in the annual and perennial grasses community would be removed, 48% of the vegetation in the pinyon-juniper woodlands would be removed, 73% of the vegetation in the sagebrush/grassland (treated) community would be removed, and 31% of the vegetation in the sagebrush/grassland community would be removed. Approximately 12% of vegetation in the riparian community would also be removed and no acres of the meadow community would be removed.

All areas affected by surface mining and facilities and road construction would be revegetated at the completion of mine activities. However, it is assumed that revegetated areas would still be susceptible to weed invasion due to the increased nutrient availability of disturbed soils that favors invasive species colonization (Lowe et al. 2003). A 30-m buffer out from these areas (see rationale in this chapter's Introduction section) leads to 1,887 acres that would become more susceptible to invasion by noxious and invasive weeds because of soil and vegetation disturbance resulting from mining and infrastructure development activities.

Vegetation in the tract and surrounding areas would be negatively impacted by dust from increased travel and construction activities during the life of mining operations.

4.15.3.4 ALTERNATIVE K1: REDUCED TRACT ACREAGE

Under Alternative K1, the tract would be modified to exclude Block NW and Block S (see Map 2.3). This modified tract would be offered for lease at a sealed-bid, competitive lease sale subject to standard and special lease stipulations developed for the tract. The boundaries of the modified tract would be reasonably consistent with the configuration shown in Map 2.3.

Consistent with the purpose and need for the action, the intent of Alternative K1 is to resolve in part or in full issues related to the local sage-grouse population, noise, and visual impacts to the town of Alton as well as issues related to conflicting land uses (agriculture versus surface mining). Alternative K1 may also reduce impacts to other resources such as AVF, springs and surface waters, wildlife, soils, public health and safety, paleontological resources, cultural resources, and vegetation. Potential impacts to vegetation would be the same in nature as those described under the Proposed Action and Alternative C, but would vary in magnitude.

4.15.3.4.1 Effects of Surface-mining Activities on Vegetation

Of the total 1,012 acres of surface disturbance that would occur in the Alton Coal Tract under Alternative K1, 869 acres would be the direct result of surface-mining operations (pit disturbance). Of this total, 11 acres of disturbance would occur on existing roads, and the remaining 858 acres would occur in vegetation communities. However, this disturbance would not all occur at one time. There would be a single open pit (approximately 120 acres), and at any one time, there would be approximately 120 acres of open surface-mining pit disturbance and an additional 120 or more acres in some stage of reclamation.

4.15.3.4.2 Upland Areas

Under Alternative K1, approximately 858 (42%) of the 2,052 acres of vegetated uplands in the tract would be disturbed by surface mining (Table 4.15.12). Of this total, 182 acres would be in annual and perennial grasses, 415 acres would be in pinyon-juniper communities, 73 acres would be in the sagebrush/grassland community, and 188 acres would be in the sagebrush/grassland (treated) community. Active restoration would be needed after mining operations are complete and the land has been regraded.

Table 4.15.12. Acres of Upland Vegetation Communities Directly Disturbed by Surface Mining under Alternative K1

Upland Vegetation Community	Acres Disturbed	Total Acres in Tract	Percentage Disturbed by Surface Mining
Pinyon-juniper woodlands*	414.5	1,095.1	37.9%
Sagebrush/grassland (treated)	188.1	289.5	65.0%
Sagebrush/grassland	72.9	369.1	19.8%
Annual and perennial grasses	182.2	247.0	73.8%
Mountain brush	0.0	40.8	0.0%
Rabbitbrush	0.0	10.7	0.0%
Surface Mining Total	**857.7**	**2,052.2**	**41.8%**

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Approximately 20% of sagebrush/grassland acres, 65% of sagebrush/grassland (treated) communities, and 38% of pinyon-juniper woodlands in the tract would be eliminated from surface-mining activities. Revegetation efforts would focus on restoring these areas to sagebrush and grassland ecosystems to benefit the watershed, wildlife, and livestock; therefore, a total elimination of pinyon-juniper and mountain brush community acreages in the mining footprint would be likely in the short and long term.

Because annual and perennial grasses are not considered a native vegetation community, a reduction of 74% is not considered a loss to the native vegetation resource. Impacts to annual and perennial grasses removed during surface mining and associated activities would be mitigated by reclamation and revegetation with native and non-native rangeland-suitable plants upon completion of mining activities.

4.15.3.4.2.1 Wetland Areas

Disturbance from surface mining would not impact the meadow vegetation community because the area containing the meadow vegetation community would not be included in the tract under this alternative.

4.15.3.4.2.2 Riparian Areas

Disturbance from surface mining is expected to remove 3.7 acres of riparian vegetation. This is approximately 8% of the total 54 acres of riparian vegetation in the tract. Revegetation of this area at the completion of mining activities would be required, and would lead to an increase in vegetation quality due to the requirements of rangeland health standards and agency objectives for reclamation.

4.15.3.4.3 Effects of Facilities Construction Activities on Vegetation

Centralized facilities associated with mining activities on the Alton Coal Tract would be located on approximately 36 acres of BLM-administered land in the tract's no-coal zone (areas outside of pit disturbance boundaries) (see Map 2.3). This is the same as under the Proposed Action and Alternative C.

Dispersed facilities would occupy 92 acres of land in the tract. The placement of these facilities would be the same as under the Proposed Action. Although, the maximum potential and estimated vegetation disturbance by vegetation community would be less due to the smaller size of the tract under this alternative (Table 4.15.13). When constructing dispersed facilities, riparian vegetation would be avoided where practicable.

Table 4.15.13. Acres of Vegetation Communities Potentially Disturbed by Construction of Dispersed Facilities under Alternative K1

Vegetation Community	Maximum Potential Acres Disturbed	Estimated Acres Disturbed
Pinyon-juniper woodlands*	92	47.7
Sagebrush/grassland	92	16.1
Sagebrush/grassland (treated)	92	12.6
Mountain brush	5.7	1.7
Annual and perennial grasses	39.9	10.8
Rabbitbrush	10.2	0.5
Riparian	46.5	2.4

* This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Avoidance criteria would also be the same as under the Proposed Action and Alternative C. Assuming construction of dispersed facilities takes place in upland areas, this would be a loss of an additional 92 acres of upland vegetation, or 4% of the total 2,114 upland acres in the tract.

4.15.3.4.4 Effects of Road Relocation on Vegetation

Approximately 16 acres of vegetation on BLM-administered land in the tract would be removed from the relocation of KFO Route 116 under Alternative K1 (Table 4.15.14).

Table 4.15.14. Acres of Vegetation Communities Directly Disturbed by KFO Route 116 Relocation on BLM-administered Lands in the Tract under Alternative K1

Upland Vegetation Community	Acres Disturbed Road Surface	Acres Disturbed ROW	Total Acres in Tract	Percentage Disturbed by Road Relocation
Pinyon-juniper woodlands*	2.9	5.1	1,095.1	0.7%
Sagebrush/grassland (treated)	0.3	0.6	289.5	0.3%
Sagebrush/grassland	0.8	1.4	369.1	0.6%
Annual and perennial grasses	1.4	2.4	247.0	1.5%
Mountain brush	0.0	0.0	40.8	0.0%
Riparian	0.1	0.2	54.0	0.6%
Rabbitbrush	0.2	0.3	10.7	4.7%
Meadow	0.0	0.0	0.0	0.0%
Road relocation total	**5.7**	**10.0**	**2,106.2**	**0.7**%

*This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Road relocation alone would not disturb large acreages of land in the tract. The greatest disturbance by percentage (4.7%) would occur in the rabbitbrush vegetation community. No disturbance from road relocation would affect meadow or mountain brush communities. These acreages are less than those under the Proposed Action and Alternative C.

4.15.3.4.5 Increased Risk for Weed Invasion

Because BMPs would be implemented during mining activities, it is assumed that no new weed species would be introduced to the tract. It is also assumed that BMPs would prevent the spread of weeds from the tract to the reasonably foreseeable coal haul transportation route. However, it is possible that weed species currently present in the tract could expand their ranges. Canada thistle, the only state-listed noxious weed in the tract, also tends to spread into disturbed areas (Morishita 1999). Soil and vegetation disturbance associated with mining are planned to occur in areas currently occupied by both these species under this alternative.

A 30-m buffer around all proposed roads, construction facilities, and surface mines was used to calculate the potential for spread of weeds as a result of proposed activities under Alternative K1. The results of these calculations are shown in Table 4.15.15.

Table 4.15.15. Acres of Land at Increased Risk for Weed Invasion under Alternative K1

	Area (acres) or Length (miles)	Additional Area included in 30-m Buffer*	Total Acres at Increased Risk for Weed Invasion
Centralized facilities	35.8	9.5	45.3
Dispersed facilities	92.0	unknown	92.0 (plus unknown buffer)
KFO Route 116 relocation	5.7 (2 miles)	46.3	52.0
Surface mine	868.6	77.9	946.5
Total			**1,135.8**

*Some buffered areas extend into the surrounding nontract area.

The construction and mining activities proposed under Alternative K1 would increase the acres of surface disturbance and land susceptible to weed invasion by 1,136 acres over the No Action Alternative. This includes the mining and construction footprint areas, as well as the 30-m buffers around these disturbances. Mined areas, even though they are to be revegetated at the completion of activities, would still be susceptible to weed invasion. Disturbed soils are generally more susceptible to invasion (DiTomaso 2000); the soils in these areas would be repositioned and regraded and would otherwise be dissimilar to the native soils that existed pre-disturbance.

4.15.3.4.6 Revegetation

Under Alternative K1, recoverable portions of in-place coal reserves would be mined over approximately 16 years using surface and underground mining methods. Reclamation would be concurrent with mining over the course of the estimated 16-year mine life and would be followed by a minimum 10-year reclamation and revegetation monitoring period.

The entire 861 acres affected by surface mining under Alternative K1 would be revegetated. The 128 acres affected by centralized and dispersed facilities construction would also be revegetated as deconstruction occurs. Specific revegetation plans, including target communities for restoration, would be implemented by the lessee in accordance with guidance from the BLM and the DOGM. Wetland revegetation plans would have to be made in accordance with USACE guidelines and mitigation requirements. General methods for revegetation are outlined in Chapter 2.

Revegetation in the mining and development footprint would most likely change the distribution of vegetation communities; mainly as a reduction in pinyon-juniper woodlands and an increase in sagebrush and grassland communities.

4.15.3.4.7 Other Actions

Increased traffic on highways and new roads, construction, and mining would lead to an increase in fugitive dust, which would create short-term, direct negative impacts to vegetation in all communities in the tract and surrounding area. Dust on leaf surfaces inhibits stomatal function and photosynthesis (Hirano et al. 1995) and reduces overall plant health. This effect is likely to be felt by vegetation in the tract and surrounding area for the life of the mine. It is assumed that the coal haul trucks would be covered or otherwise contained, preventing coal dust from escaping and affecting vegetation along the reasonably foreseeable coal haul transportation route.

Increased O_3 pollution from the burning of fossil fuels in coal haul trucks and construction vehicles/equipment would also lead to potential impacts on vegetation communities in the tract and along the reasonably foreseeable coal haul transportation route. Ground-level O_3 causes more damage to plants than all other air pollutants combined (USDA 2012). O_3 enters plants' leaves through their stomata during normal gas exchange. Plants exposed to O_3 can exhibit symptoms such as chlorosis (yellowing of leaves due to reduced production of photosynthetic pigments) and leaf die-off. Other symptoms of O_3 exposure include flecks (irregular, light-tan spots less than 1 mm in diameter), stipples (small, darkly pigmented areas approximately 2–4 mm in diameter), bronzing, and reddening (USDA 2012). The type and severity of the symptoms depend on factors such as the duration and concentration of O_3 exposure, and the symptoms can vary from one species to another (USDA 2012). With constant daily exposure to O_3, flecking, bronzing, and reddening are gradually replaced by yellowing and loss of leaves (USDA 2012).

The effects of vegetation management would be the same in nature as those described under the No Action Alternative. However, because the sage-grouse mitigation plan (see Section 4.18.2.1.2.3) would be applied to any of the action alternatives as a design feature, the level of vegetation management would be greater under Alternative K1 than under the No Action Alternative to compensate for the greater level of surface disturbance.

4.15.3.4.8 Summary of Effects of Management Actions on Vegetation under Alternative K1

The acres of vegetation affected by each type of surface disturbance are shown in Table 4.15.16. Acres affected by underground mining are not shown because they would not result in direct removal of vegetation at the surface.

Table 4.15.16. Acres of Each Vegetation Community to be Removed from Surface-disturbing Activities in the Alton Coal Tract under Alternative K1

Vegetation Community	Total Acres in Tract	Acres Disturbed by:				Total Acres Removed*	Percentage Total to be Disturbed
		Surface Mining	Centralized Facilities Construction	Dispersed Facilities Construction†	KFO Route 116 Relocation		
Meadow	0.0	0.0	0.0	0.0	0.0	0.0	0%
Mountain brush	40.8	0.0	0.0	1.7	0.0	1.7	4.2%
Annual and perennial grasses	247.0	182.2	0.0	10.8	3.8	196.8	79.7%
Pinyon-juniper woodlands‡	1,095.1	414.5	1.4	47.7	8.0	471.6	43.1%
Rabbitbrush	10.7	0.0	0.0	0.5	0.5	1.0	9.3%
Riparian	54.0	3.7	0.0	2.4	0.3	6.4	11.9%
Sagebrush/grassland	369.1	72.9	0.0	16.1	2.2	91.2	24.7%
Sagebrush/grassland (treated)	289.5	188.1	34.3	12.6	0.9	235.9	81.5%
Total	**2,106.2**	**861.4**	**35.7**	**91.8**	**15.7**	**1,004.6**	**47.7%**

* In addition to dispersed facilities to be constructed.

† Specific placement of facilities is unknown at this time; however, acres of vegetation removal were estimated by apportioning total dispersed facility acres across vegetation communities based on their percentage of land in the tract. Additional information on this approach, as well as a more conservative estimate of total potential acreage, is discussed in Section 4.15.3.4.3.

‡ This association includes areas of pinyon-juniper/mountain brush, pinyon-juniper/sagebrush, and pinyon-juniper/sagebrush/mountain brush communities.

Within the total 2,106 acres of land in the tract currently occupied by vegetation, 1,005 acres (48%) would be removed from surface-mining and construction activities (including 92 acres for dispersed facilities). Four percent of the vegetation in the mountain brush community would be removed, approximately 80% of the vegetation in the annual and perennial grasses community would be removed, 43% of the vegetation in the pinyon-juniper woodlands would be removed, 82% of the vegetation in the sagebrush/grassland (treated) community would be removed, and 25% of the vegetation in the sagebrush/grassland community would be removed. Approximately 12% of vegetation in the riparian community would also be removed, and no acres of the meadow community would be removed.

All areas affected by surface mining and facilities and road construction would be revegetated at the completion of mine activities. However, it is assumed that revegetated areas would still be susceptible to weed invasion due to the increased nutrient availability of disturbed soils that favors invasive species colonization (Lowe et al. 2003). A 30-m buffer out from these areas (see rationale in this chapter's Introduction section) leads to 1,136 acres that would become more susceptible to invasion by noxious and invasive weeds because of soil and vegetation disturbance resulting from mining and infrastructure development activities.

Vegetation in the tract and surrounding areas would be negatively impacted by dust from increased travel and construction activities during the life of the mine.

4.15.4 Potential Mitigation Measures

The protective measures for vegetation described above and in the Management and Considerations Common to Each Action Alternative section of Chapter 2 would mitigate and/or minimize impacts to vegetation resources in the tract. These mitigation measures would help to reduce the amount and severity of weed infestations and would help to restore native vegetation communities. No potential mitigation measures are recommended.

4.15.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts would occur where vegetation resources are removed during mining pit disturbance, soil stockpiling, road and infrastructure development, and other mine operations. These impacts would be mitigated by site reclamation and revegetation concurrent with mining that would minimize soil loss or weed invasion in disturbed sites. Unavoidable loss would occur where special status plant species are not detected or identified during surveys and are subsequently lost. Implementation of mitigation and monitoring plans would reduce the risk of loss or destruction of special status plant species. Unavoidable loss of special status plant species due to nondetection or loss of function in native vegetation communities from inadvertent adverse impacts would also occur.

4.15.6 Short-term Uses versus Long-term Productivity

Surface mining and infrastructure development and use during the life of the mine would negatively impact the short-term productivity of vegetation communities. The vegetation communities present in the tract are typically slow to recover from disturbance. Productivity would be limited during reclamation and restoration activities for the time period required for plants to grow to mature size and for the development of functioning vegetation communities. Long-term productivity would be reduced because vegetation communities are unlikely to be fully developed immediately following mining and restoration activities. Until vegetation communities are fully developed, these habitats would be less diverse (Belnap et al. 2001) and less productive (Garcia-Pichel et al. 1996) where ecologically important habitat components such as biological soil crusts have been lost. Effective implementation of the regulatory compliance and mitigation measures outlined in Chapter 2 and enumerated above would minimize impacts to the long-term productivity of vegetation communities.

4.15.7 Irreversible and Irretrievable Commitments of Resources

The protective measures detailed in Chapter 2 and enumerated above require the reclamation of disturbed areas following completion of the management action. Because vegetation resources would be restored or rehabilitated after proposed disturbance and/or development, there would be no anticipated irreversible impacts on vegetation resources associated with the management decisions proposed for the tract. However, there would be irretrievable impacts associated with surface-disturbing activities proposed throughout the tract. The vegetation that would be removed or disturbed to facilitate mining would be irretrievably lost until successful restoration took place.

4.16 Water Resources

This section addresses potential impacts on surface water, groundwater, wetlands and riparian areas, floodplains, and AVFs from the removal of coal from the Alton Coal Tract using primarily surface-mining methods. Direct and indirect effects would consist of 1) surface-water depletions; 2) potential degradation of surface-water quality from increased sediment delivery and subsequent changes in turbidity, dissolved solids, or temperature; 3) groundwater depletions; 4) potential degradation of groundwater quality from increased TDS; 5) disturbance to wetland and riparian areas and floodplains; and 6) indirect impacts to AVFs that may exist adjacent to areas where surface mining would occur (in a reconnaissance-level survey, there were no probable AVFs identified in areas that would be surface mined). Impacts to the quality of deep groundwater are not discussed in the alternatives analysis because no impacts are expected to deep groundwater resources (as described in Section 3.16.2.) under any alternative. Though transportation of coal by truck from the tract to a rail loadout near Cedar City, Utah, represents a risk to surface-water resources near the coal haul transportation route from coal dust and potential accidents, these impacts would be minimized by implementation of spill management planning and best available control measures to minimize and/or eliminate fugitive coal dust.

Under any action alternative, all potential direct and indirect impacts to groundwater resources would occur within the Kanab Creek watershed/shallow aquifer boundary. Under any action alternative, the successful bidder would be required to comply with state and federal mining regulations intended to reduce or eliminate impacts to surface and groundwater resources (see Table 2.6.1 and Section 4.16.1). Hazardous materials contained and used in the tract represent a risk of contamination to near-surface groundwater and surface-water resources from spills. Spills would be contained and mitigated in accordance with applicable state and federal regulations dealing with hazardous materials (see Table 2.6.1 and Section 4.7.1). Potential subsidence in the portion of the tract that would be underground mined could result in changes to surface draining and deterioration of surface-water quality as well as changes to groundwater levels, flow, and quality.

As a part of the process of obtaining a coal mining permit from DOGM, the successful bidder for the Alton Coal Tract would be required to meet all applicable requirements of the Utah coal mining rules (R645 of the UAC). Among these is the requirement that the mine operator monitors the quality and quantity of groundwaters and surface waters during the period of active mining operations and continuing through bond release (R645-301-731.200). Monitoring plans for groundwater and surface water are developed based on a determination of the probable hydrologic consequences of coal mining for the specific mining operation, and on an analysis of all baseline hydrologic, geologic, and other information contained in the permit application. The plans provide for monitoring of parameters that relate to the suitability of the groundwater and surface water for current and approved post-mining land uses and to monitor for potential impacts to the hydrologic balance in the area. Typically, monitoring plans are designed to include the monitoring of all important groundwater and surface-water resources in and adjacent to mining areas.

The specific groundwater and surface-water monitoring plans that would be developed before mining on the tract begins would be designed based on the details of the specific MRP proposed by the successful bidder. Because such information is not usually available during the tract leasing stage, groundwater and surface-water monitoring plans are typically developed during the mine permitting stage when detailed information regarding the proposed mining plan is available. However, it is likely that the groundwater and surface-water monitoring plans for the new tract would be similar to those previously approved by DOGM for the existing Coal Hollow Mine. At the existing Coal Hollow Mine, the water monitoring plan includes 54 monitoring sites that are monitored on a quarterly basis. The monitoring information is submitted to DOGM, which then conducts a quarterly review and analysis of the submitted information. The water monitoring information is freely available for public access through the DOGM on-line coal water quality database. The water monitoring program at the existing Coal Hollow Mine includes monitoring at 10 stream locations, 12 spring locations, and 32 well monitoring locations. Water quantity parameters (flow rates for streams and springs and water levels for wells) are performed at all 54 monitoring stations. Field water quality measurements including temperature, pH, and specific conductance (and dissolved oxygen concentrations at streams) are performed at 29 monitoring sites. Laboratory water quality analyses are performed on water samples from 20 monitoring locations.

4.16.1 Regulatory Framework

Numerous federal and state regulations shape the management of water resources. Regulations that pertain to water resources and potential impacts from mining and other land uses include the following:

- The Fish and Wildlife Coordination Act (1934), as amended, provides the basic authority for USFWS's involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. The Water Resources Act of 1954, as amended, permits the Secretary of the Interior to give grants to and cooperate with federal, state, and local agencies to undertake research into any water problems related to the DOI’s mission.
- The Water Resources Planning Act of 1965, as amended, established the Water Resources Council, which is directed to maintain studies of water supplies and water programs. The chairperson of any river basin commission can request from an agency, and that agency is authorized to furnish, such information as is necessary to carry out its function.
- The Federal Pollution Control Act (with amendments in 1972 and in 1977 as the CWA) has the objective of restoring and maintaining the chemical, physical, and biological integrity of the nation’s waters. The CWA of 1987 provides additional authorizations.
- FLPMA requires that public lands be managed in a manner that will protect scientific, environmental, air and atmospheric, and water resource values. It also requires that land use plans be in compliance with applicable pollution control laws, including state and federal air, water, and other pollution standards.
- SMRCA requires federal agencies to gather hydrologic data to ascertain the suitability for mining, and requires that mine operators “minimize disturbances to the prevailing hydrologic balance at the mine-site and in associated off-site areas and to the quality and quantity of water in surface and ground water systems both during and after surface coal mining operations and during reclamation” (30 USC 1265(b)(10)).
- The Safe Drinking Water Act of 1977 protects all public water systems from pollutants or contaminants that would endanger public health and welfare. Activities on public lands in these watersheds must not cause contaminant levels to exceed promulgated standards.
- 40 CFR 434 applies to 1) effluent discharges from any coal mine at which the extraction of coal is taking place or is planned to take place and 2) coal preparation plants and associated areas.
- EO 11988, Floodplain Management, requires federal agencies to take actions that avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.
- EO 11990, Protection of Wetlands, requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

The KFO RMP, other BLM regulations, and state regulations have provided the framework for other required protection measures. BMPs that may be required to minimize potential water-quality impacts (including sediment control from dispersed facilities) could include silt fences, fiber rolls, mulching, check dams, brush berms, and the use of appropriately placed and installed straw or hay bales (EPA 2013g). Other standards applicable to water resources related to mining the tract include the following:

- UPDES permitting process administered by the Utah Division of Water Quality requires that a water-quality discharge permit be obtained for construction and coal mining operations. UPDES storm water permits require BMPs to mitigate storm water discharge. After August 1, the successful bidder would be required to monitor turbidity in storm water to assure compliance with Effluent Limit Guidelines 280 Nephelometric Turbidity Units (40 CFR 450).
- The Division of Water Rights may require issuance of a permit for the diversion and/or evaporation of water associated with retention ponds.
- Spill prevention, control, and countermeasure regulations apply to any operation with greater than 1,320 gallons of oil storage capacity on-site. Regulated facilities also include those that could reasonably be expected to discharge oil in harmful quantities into the navigable waters of the U.S. or adjoining shorelines.
- The successful bidder for the tract would be required to develop and implement a detailed, site-wide water management plan as part of the mine's MRP administered by DOGM. The DOGM permitting process has multiple provisions for the mitigation of potential impacts to water resources.
- The successful bidder for the tract would be required to build and maintain sediment control ponds or other devices during mining.
- The successful bidder for the tract would be required to monitor storage capacity in sediment ponds.
- The successful bidder for the tract would be required to monitor quality of discharges through the UPDES permit.
- The successful bidder for the tract would be required to restore approximate original drainage patterns during reclamation.
- The successful bidder for the tract would be required to monitor stream flow and water quality and selected springs in and adjacent to the tract.
- The successful bidder for the tract would be required to restore stock ponds and playas during reclamation.
- The successful bidder for the tract would be required to identify all wetlands that would be affected by mining.
- The successful bidder for the tract would be required to identify jurisdictional wetlands, as required by USACE, and replace any that would be disturbed by mining.
- The successful bidder for the tract would be required to replace functional wetlands, as required by surface managing agency, surface landowner, and/or the DOGM.
- The successful bidder for the tract would be required to monitor reclaimed wetlands using the same procedures used to identify pre-mining jurisdictional wetlands.
- The successful bidder for the tract would be required to repair subsidence-related disturbances in accordance with UAC 40-10.

As part of the permitting process, a full analysis of potential impacts associated with underground and/or surface-mining operations would be performed. This would include a determination of the probable hydrologic consequences of the underground and/or surface coal mining activities. Additionally, DOGM has the responsibility to assess the potential for mining impacts both inside and outside permit areas. The cumulative hydrologic impact assessment (CHIA) is a findings document prepared by DOGM that assesses whether existing, proposed, and anticipated coal mining and reclamation operations have been designed to prevent material damage to the hydrologic balance outside the permit area. DOGM cannot issue a permit to a proposed coal mining operation if the probable anticipated hydrologic impacts will create material damage to the hydrologic balance outside the permit area. The CHIA is not only a determination if coal mining operations are designed to prevent material damage beyond their respective permit boundaries when considered individually, but also if there will be material damage resulting from effects that may be acceptable when each operation is considered individually but are unacceptable when the cumulative impact is assessed (DOGM 2009).

In conjunction with the mine permitting process, hydrologic monitoring plans for surface water and groundwater are implemented. The monitoring information is used to allow DOGM to assess potential impacts to the hydrologic balance. Hydrologic monitoring continues after the completion of mining through bond release. Any discharges of water from the mining operation to surrounding watercourses are regulated through the UPDES program administered by the Utah Division of Water Quality.

4.16.2 Impact Indicators, Thresholds, Area of Analysis, and Assumptions

4.16.2.1 SURFACE WATER

The analysis area for direct and indirect impacts to the drainage condition of streams is the Alton Coal Tract. Impacts to stream channel condition are assessed according to the length of stream altered or realigned and the number of stream crossings required for mining operations. It is assumed that a portion of Robinson Creek would be realigned to allow surface mining to occur. In addition, one or two stream crossings of Kanab Creek would be required.

The tract is in parts of three subdrainages (HUC 12) of Kanab Creek: Reservoir Canyon, Lower Robinson Creek, and Sink Valley Wash. The analysis area for direct and indirect impacts on surface water is the area (40,040 acres) of these three subdrainages (see Map 3.17).

One way that impacts to surface-water hydrology in this section are assessed is by estimating the total annual runoff from the tract that would be collected in ponds. Water collected in ponds would be subject to increased evaporation and infiltration, which would constitute a loss of runoff to surface waters. Impacts to surface-water quality are also assessed by qualitatively describing the risk of impairment of surface waters, as indicated by state water-quality standards, which serve as threshold indicators for surface-water quality impacts. The criteria used for all surface waters are those listed by the State of Utah for Kanab Creek; the creek's most stringent criteria are for the beneficial use as a warm water fishery (3B). Risk of impact measurements under each alternative included the area of each surface use or disturbance, such as roads, graded ROWs, facilities, soil stockpiles, and mine pits. In addition, impacts to surface-water quality are assessed through the linear feet of creek realigned (to indicate the relative magnitude of thermal impacts and increases in dissolved solids and other constituents).

The impact indicators to assess impacts from dust deposition as well as risk of spills associated with the transportation of hazardous materials to surface waters along the reasonably foreseeable coal haul route are the feet (miles) of stream within 100 feet of the transportation route and the number of times this route crosses perennial streams and intermittent drainages.

In the analysis, it is assumed that surface runoff from all pit disturbances and centralized facilities would be captured in sediment retention ponds. The area draining to the ponds is assumed to be the total projected surface disturbance from pits and centralized facilities (1,786 acres under the Proposed Action, 1,490 acres under Alternative C, and 905 acres under Alternative K1). Water would not be released from these ponds; therefore, it is assumed that the ponds would be 100% effective at controlling sediment. Water would be lost only to evaporation or infiltration. Water loss from the ponds is estimated using local evaporation rates on a per-unit area basis. It is assumed that there would be minor recharge to shallow groundwater systems from pond infiltration due to the low permeability of these aquifers. In either case, the retention ponds represent a 100% loss of surface water from the tract for immediate use by irrigators downstream. Sediment runoff would not be captured in retention ponds from dispersed facilities and the relocation of KFO Route 116. It is assumed that sediment from these areas would be controlled using BMPs such as silt fencing, straw wattles, and matting, as required by UPDES storm water permitting.

Because underground mining activities produce unique risks to surface-water systems, a separate qualitative summary of potential subsidence and hydrologic changes from underground mining is also provided. Additional discussion of subsidence impacts is provided in Section 4.6, Geology and Minerals. The acreage subject to subsidence-related impacts is the same under all action alternatives.

4.16.2.2 GROUNDWATER

The analysis area for direct and indirect impacts to groundwater quality and quantity is the area that would be disturbed from surface mining (1,750 acres under the Proposed Action, 1,454 acres under Alternative C, and 869 acres under Alternative K1). Impacts to groundwater hydrology are assessed according to groundwater losses due to reduced recharge, consumptive use for coal mining activities, and evaporation of groundwater exposed in pits.

Impacts to groundwater quality are assessed by qualitatively describing the risk of impairment of shallow groundwater, as indicated by state surface-water quality standards, for typical underground water uses in the area as identified in the Utah Division of Water Rights database (i.e., irrigation and stock watering). The principal parameter of concern for these groundwater uses is TDS. The Utah TDS standard for irrigation and stock watering is 1,200 mg/L.

The moisture content of coal in the Smirl Coal Zone is 13% and includes moisture that is bound in the organic matter and/or hydrated clays found in the coal zone. It represents an additional groundwater resource separate from mined groundwater that could be lost due to removal of 2 million tons of coal per year under the Proposed Action, Alternative C, and Alternative K1.

As with surface-water resources, underground mining impacts to groundwater from subsidence and hydrology changes are discussed qualitatively as a separate analysis. Additional discussion of subsidence impacts is provided in Section 4.6, Geology and Minerals. The acreage subject to subsidence-related impacts is the same under all action alternatives.

4.16.2.3 WETLANDS, RIPARIAN AREAS, FLOODPLAINS, AND ALLUVIAL VALLEY FLOORS

The area of analysis for wetlands, riparian areas, floodplains, and AVFs is the tract and its immediate surroundings. The impact indicators for these resources are the linear feet of associated waterways and acres of identified wetlands, riparian, floodplains, and AVFs in areas of anticipated surface mining (within the coal zone) and areas of potential dispersed facilities, centralized facilities, and road relocations (outside of the coal zone) in the tract.

A preliminary JD was completed in November 2012 (USACE 2012b). It concludes that 54.0 acres of wetlands in the tract are potential waters of the U.S. regulated under Section 401 of the CWA. In all, 24 individual wetlands areas were identified during the delineation (see Map 2.4). These wetland areas were classified into three habitat types: approximately 18.5 acres are riparian wet meadow wetlands, 31.6 acres are irrigated wet meadow wetlands, and 3.8 acres are mixed riparian scrub-shrub/wet meadow wetlands (Frontier Corporation USA 2012).

With respect to floodplains, it is assumed that any in the tract would be subject to protections and regulations detailed in EO 11988. For the purposes of this analysis, it is further assumed that all waterways in the analysis area support floodplains.

Areas identified as probable AVFs during a reconnaissance-level survey (see Appendix F) are assumed to be AVFs in the analysis. During the permitting process, a more extensive study to determine the presence of AVFs would be required.

4.16.3 Alternative A: No Action

Under the No Action Alternative, ACD's application to lease the coal included in the Alton Coal Tract under the Proposed Action, Alternative C, or Alternative K1 would not be approved, the tract would not be offered for competitive lease sale, and the coal in the tract would not be mined.

No coal-mining activities or infrastructure development would occur under the No Action Alternative, and therefore no surface disturbance would occur in the tract as a function of mining operations (Table 4.16.1). However, existing land uses would continue, including livestock grazing, recreation, and vegetation treatments for wildlife habitat and watershed health.

Table 4.16.1. Surface Disturbance (acres) and Creek Realignment (miles) under all Alternatives

Disturbance Type	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)	Alternative K1 (Reduced Tract Acreage)
Pit disturbance	0	1,750	1,454	869
Centralized facilities	0	36	36	36
Dispersed facilities	0	160	135	92
Road relocation	0	47 (17 actual road and 30 ROW)	37 (13 actual road and 24 ROW)	16 (6 actual road and 10 ROW)
Total Surface-disturbing activities	**0**	1,993	1,662	1,012
Underground mining	0	613	613	613
Robinson Creek realigned (miles)	0	0.49	0.49	0.49

4.16.3.1 SURFACE WATER

Discussions of site-specific potential for impacts to surface-water systems under the No Action Alternative in specific surface-water drainages are presented in the subsections below. Because there would be no impacts to surface water under the No Action Alternative beyond those impacts from ongoing land uses, the heading/subheading structure of this section differs from the corresponding sections analyzing the impacts under Alternatives B, C, and K1. This section does not have subheadings for surface-water quantity and use, surface-water quality, or drainage conditions.

4.16.3.1.1 Kanab Creek

Under the No Action Alternative, no impacts to surface-water quantity and quality in Kanab Creek beyond those impacts from ongoing land uses would occur. The uses include livestock grazing, vegetation treatments, and recreation. These ongoing impacts may include active erosion along the Kanab Creek stream channels in the tract (Petersen Hydrologic 2007). Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to surface-water quality or quantity in Kanab Creek.

Reportedly a result of land management practices in the late 1800s or early 1900s, the creeks in the tract have limited riparian vegetation, in many locations are not stable in their current configurations, are actively eroding their channels during precipitation events, and are deeply incised (Petersen Hydrologic 2007). Under the No Action Alternative, the creek's channels would remain incised and would continue to contribute sediment to the creek during periodic high-flow events.

4.16.3.1.2 Simpson Hollow Creek

Under the No Action Alternative, no impacts to surface-water quantity and quality in Simpson Hollow Creek beyond those from ongoing land uses (livestock grazing, crop irrigation, and vegetation treatments) would occur. Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to surface-water quality or quantity in Simpson Hollow Creek.

4.16.3.1.3 Lower Robinson Creek

Under the No Action Alternative, no impacts to surface-water quantity and quality in Lower Robinson Creek beyond those impacts from ongoing land uses would occur. Ongoing impacts to Lower Robinson Creek in the tract would include active erosion along the Lower Robinson Creek stream channel in the tract (Petersen Hydrologic 2007). Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to surface-water quality or quantity.

Lower Robinson Creek has limited riparian vegetation. In many locations, it is not stable in its current configuration, is actively eroding its channel during precipitation events, and is deeply incised in most locations (Petersen Hydrologic 2007). The creek's channels would remain incised and would continue to contribute sediment to the creek during periodic high-flow events.

All mine discharges from the Coal Hollow Mine are regulated under a UPDES discharge permit administered by the Utah Division of Water Quality. Any potential impacts to Robinson Creek associated with these non-extractive activities on the tract would continue to occur under the No Action Alternative for the remainder of the life of the Coal Hollow Mine.

4.16.3.1.4 Ephemeral Washes

Under the No Action Alternative, no impacts to surface-water quantity and quality in ephemeral washes in the tract beyond those impacts from ongoing land uses would occur. These ongoing impacts may include active erosion along stream channels in the tract (Petersen Hydrologic 2007). Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to surface-water quality or quantity in the ephemeral washes in the tract. Currently, in most locations, the ephemeral washes in the tract are deeply incised and susceptible to erosion during periods of high flows. Under the No Action Alternative, channels would remain incised and would continue to erode and contribute sediment to the washes during periodic high-flow events.

4.16.3.2 GROUNDWATER

Discussions of the potential for site-specific impacts to groundwater under the No Action Alternative in individual portions of the tract are presented in the subsections below. Because there would be no impacts to groundwater under the No Action Alternative beyond those from ongoing land uses, the heading/subheading structure of this section differs from the corresponding sections analyzing the impacts under Alternatives B, C, and K1. This section does not have subheadings for groundwater hydrology or groundwater quality.

4.16.3.2.1 Block C

No impacts to groundwater quantity or quality in Block C would result under the No Action Alternative beyond those existing impacts associated with ongoing land uses. Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to groundwater quality or quantity in this block.

4.16.3.2.2 Block NW

No impacts to groundwater quantity or quality in Block NW would result under the No Action Alternative beyond those impacts from ongoing land uses. Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to groundwater quality or quantity in this block.

4.16.3.2.3 Blocks CWN and CWS

No impacts to groundwater quantity or quality in Block CWN and CWS would result under the No Action Alternative beyond those impacts from ongoing land uses. Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to groundwater quality or quantity in these blocks.

4.16.3.2.4 Blocks S and Sa

No impacts to groundwater quantity or quality in Blocks S and Sa would result under the No Action Alternative beyond those impacts from ongoing land uses. Because no mining, construction, or additional surface disturbance would occur under the No Action Alternative, there would be no additional impacts to groundwater quality or quantity in these blocks.

4.16.3.3 WETLANDS, RIPARIAN AREAS, FLOODPLAINS, AND ALLUVIAL VALLEY FLOORS

Under the No Action Alternative, the wetlands (54.0 acres) present in the tract would not be disturbed from mining the tract; therefore, no impacts are anticipated under this alternative. All the wetlands and riparian areas delineated are on private agricultural lands that are subjected to periodic agricultural disturbances. Under the No Action Alternative, no mine-related disturbance to riparian areas (55.3 acres), floodplains (57.0 acres), or AVFs (57.0 acres) in the tract would occur either.

4.16.4 Alternative B: Proposed Action

Under the Proposed Action, the Alton Coal Tract would be offered for lease at a sealed-bid competitive lease sale, subject to standard and special lease stipulations developed for the tract. The tract boundaries under the Proposed Action (see Map 1.2) would be reasonably consistent with the tract reconfiguration completed by the BLM after ACD's original lease application submittal (see Map 2.7). Approximately 1,993 acres of surface disturbance would occur in the Alton Coal Tract under the Proposed Action (see Table 4.16.1). Similarly, underground mining would occur on 613 acres of land in the tract.

Coal removal by underground mining methods and the withdrawal of water to facilitate mining would result in subsidence as overlying strata settle into mining-produced voids. Subsidence is a natural consequence of underground mining; although, the magnitude and extent vary based on a range of mining and geologic factors, such as surface topography, depth of mining, near-surface geology, and mining method (Society for Mining 1992). In the tract, 613 acres would be affected by subsidence through underground mining. An additional 166 acres outside the tract would be disturbed through ground movement associated with coal removal (areas outside the tract that could be impacted through subsidence would be regulated under a mining permit administered by DOGM).

4.16.4.1 SURFACE WATER

Under the Proposed Action, adverse short-term impacts to surface-water quantity would occur from the implementation of sediment- and erosion-management BMPs. Under this alternative, 1,993 acres of the tract would be disturbed by surface mining, the construction of centralized and dispersed facilities, and road relocation, which is 1,993 acres more than would be disturbed under the No Action Alternative. Runoff from 1,786 acres of pit disturbance and centralized facilities would be diverted and captured in storm water retention ponds to reduce the amount of eroded sediments that is discharged to downstream water bodies such as Kanab Creek and Robinson Creek. Areas where runoff is not captured, such as dispersed facilities and the road relocation ROW, would be treated through the use of silt fencing, check dams (e.g., straw bales), or other BMPs that slow runoff and allow sediments to settle. Because water that is permanently retained in ponds or temporarily slowed or detained is subject to additional infiltration and evaporation, loss of surface water would result.

Under the Proposed Action, approximately 29 acre-feet of water would be captured annually from pits and centralized facilities (Table 4.16.2). These values are estimated as a portion of the flow (equal to the proportion of the tract relative to the watershed area) associated with runoff from precipitation events at the USGS gauge on Kanab Creek downstream of the tract. Storm and snowmelt peaks were identified on the gauge using a simple hydrograph line method (Chow et al. 1988) and checked against climate data for the area (precipitation, snowfall, and temperature) (NCDC Station No. 420086) (Petersen 2014a). Ten years of precipitation data from the Alton NCDC climate station were used in this calculation. Pit disturbance and centralized facilities make up 1.4% of the total drainage area upstream of the USGS gauge. It was assumed that the same percentage of flow at the gauge was generated on those areas of the tract.

Because this water would be captured in retention ponds that would not discharge to downstream water bodies, the full volume of runoff captured from the tract would be lost to increased evaporation or infiltration into the ground. Maximum annual evaporation from standing water in the tract is approximately 35 inches per year. Evaporated water would be lost as a surface-water resource. In the event that water in a retention pond infiltrates (leak) through the bottom of the pond, that water would become part of the groundwater system beneath the pond. If there is an active groundwater flowpath from the groundwater beneath the pond to a surface discharge location (such as a spring or seepage zone), the leaked water could eventually return to the surface flow regime. In the absence of such a flowpath, the groundwater leaked from the pond could be held for a longer period of time in the subsurface and thus become lost from the surface flow regime.

Under the Proposed Action, no direct adverse impacts to surface-water quality are likely. Runoff from disturbed areas on the tract would be captured in retention ponds, which do not release water into downstream receiving waters. Erosion of sediment from dispersed facilities and the relocation of KFO Route 116 would be controlled with silt fences and other sediment-control BMPs. These BMPs are more than 90% effective in capturing sediment when installed and maintained properly (Robichaud et al.). Therefore, most of the sediment and associated contaminants found in surface runoff from the tract would be contained, and would not pose any direct threat to surface waters.

Indirect effects on water quality from the Proposed Action would result from the loss of 29 acre-feet of water to streams associated with diversion of surface-water runoff on the tract into retention ponds (see Table 4.16.2). This loss of water to the surface-water system would reduce flows in Robinson Creek and Kanab Creek, and thereby reduce the dilution of any pollutant (total phosphorus, suspended solids, nitrogen, or dissolved solids) downstream of the tract. This could increase the pollutant’s concentration in the surface-water system. However, reduced flow would also reduce instream erosion, and therefore could reduce sediment concentrations in the stream. The primary pollutant that could pose a concern to Kanab Creek is TDS, because current concentrations of TDS in surface water in and around the tract already exceed the standard of 1,200 mg/L identified by the State of Utah as protective of irrigation water. Water quality data in and around the tract indicate that TDS concentrations are highest under low-flow conditions. Mean TDS concentrations in groundwater in the Sink Valley Wash are 378 mg/L (maximum 623 mg/L); therefore, the use of groundwater for dust suppression would not lead to an increase in TDS concentrations in future surface runoff from the tract. Use of groundwaters or surface waters from other sources in the tract for dust suppression (which generally have appreciably higher TDS concentrations than do waters in Sink Valley) could lead to an increase in TDS concentrations in future surface runoff from the tract. In this case, salt-tolerant plants could be used for revegetation.

Increases in solute concentrations of groundwaters and surface waters can occur when groundwaters and surface waters are allowed to interact with the Tropic Shale or sediments derived from the Tropic Shale (Petersen Hydrologic 2007). When appreciable contact and interaction between groundwaters and surface waters and the Tropic Shale does occur, increases in the concentrations of TDS (and also typically magnesium and sulfate concentrations) would be anticipated. The potential for such increases in the dissolved constituents of groundwaters and surface waters can be minimized through BMPs that limit the potential for such interactions.

There are no perennial or intermittent surface-water drainages present in areas overlying or adjacent to the underground mining areas. Subsidence-related surface-water impacts in no-coal areas may include potential changes to surface drainage and deterioration of surface-water quality. Additionally, subsidence could cause fissures and pits or open cracks, which, if connected to aboveground streams, could lead to partial or complete loss of surface water (i.e., increased recharge to underlying strata) in surrounding areas. Aquifer pumping for underground mining could also interrupt groundwater flow to surface waters, leading to reduced stream flows.

Although the future operator of proposed coal mining operations at the Aton Coal Tract is not known, the fact that some exceedances of UPDES effluent limits for total iron and total suspended sediments concentrations have occurred historically at the nearby Coal Hollow Mine suggests the possibility that such occurrences could occur in the future as a consequence of mining at the Alton Coal Tract. During the period of initial mine startup construction for the Coal Hollow Mine in December 2010, discharges of both surface runoff from the mine area and groundwater intercepted in the mine pit areas to Kanab Creek occurred in response to unusually intense precipitation events. According to permit files at DOGM (2013), at that time the region experienced the 10-year, 24-hour precipitation event, followed immediately by the 100-year, 24-hour precipitation event the following day.

In response to these anomalous precipitation events, discharges of surface-water runoff occurred. In response to continued wetness in early 2011, water was discharged from the mine's sedimentation ponds through the permitted UPDES discharge points. In the six UPDES discharge events that were monitored in 2011, the TDS concentrations of the mine discharge water ranged from 704 to 1,820 mg/L, averaging 1,037 mg/L. The discharge rates at the UPDES discharge points during these events ranged from 1.3 to 15 gpm, averaging 5.4 gpm. The discharges that occurred in 2011 consisted of both surface waters and groundwaters intercepted in the mine pit areas. During these 2011 discharge events, there were the following UPDES effluent limitation exceedances at the Coal Hollow Mine:

- UPDES Serial No. 003 – 3/31/2011: total iron 1.6 mg/L; TSS 48 mg/L
- UPDES Serial No. 005 – 11/30/2011: TSS 55 mg/L; 10/31/2011 TSS 35 mg/L

Under more normal climatic conditions, discharges from the Coal Hollow Mine have been infrequent. The Coal Hollow Mine was designed to contain mine waters (and to use the water for mine operational uses such as dust suppression) such that discharge to the receiving waters would not usually be necessary. There have been no UPDES discharges from the mine operation since November 2011. The discharge of water from mining areas in the tract to surrounding waterways would be regulated through the UPDES permitting process, which is administered by the Utah Division of Water Quality. Potential impacts to the hydrologic balance that could occur from mine water discharges are also regulated by DOGM.

The EPA indicates that iron in water is not directly associated with adverse health effects (Petersen 2014b). Accordingly, the EPA has not issued a primary drinking water standard for iron. However, because iron in water can be associated with undesirable tastes, odors, discoloration, or other aesthetic conditions, the EPA has issued a secondary maximum contaminant level (SMCL) for iron of 0.3 mg/L. The EPA does not enforce SMCLs, but they are used to assist public water utilities in managing their drinking water for aesthetic considerations. The State of Utah has also set forth a numeric surface-water quality standard in the Kanab Creek drainage for dissolved iron of 1,000 µg/L for the protection of aquatic wildlife (nongame fish and other aquatic wildlife). Although there is the potential for the discharge of mine waters containing iron through UPDES discharge points into the Kanab Creek drainage, the potential impact to downstream water users is low. Water flowing in a well-aerated stream with a near-neutral pH should not contain more than a few ppb of dissolved iron (Hem 1985). Under such conditions (which are generally present in streams throughout the tract and surrounding area), dissolved iron potentially entering a stream as mine water discharge would be converted to a solid precipitate that would settle from the stream. In the event that substantially elevated iron concentrations manifest in mine discharge waters in the tract (such that treatment of the water would be required to meet the applicable water quality effluent limitations), physical and chemical treatment processes would be available, which have been used successfully elsewhere in the Utah coal industry to remove iron from mine discharge waters.

Generally, sediment entering storm water can degrade the quality of the water for drinking, wildlife use, and the land surrounding streams (Mid-America Regional Council 2014). During mining and reclamation activities, storm waters falling on disturbed areas (or areas naturally prone to erosion) can acquire elevated sediment concentrations. To minimize the potential for discharge of sediment into surrounding waterways, and in accordance with applicable state and federal rules and regulations, runoff occurring from precipitation or snowmelt events within a mine permit area would be treated using BMPs (see Section 4.16.8 below).

Potential site-specific impacts to surface-water quantity, use, and quality for individual surface-water drainages are discussed below.

Table 4.16.2. Water Resource Impacts under all Alternatives

Disturbance Type	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)	Alternative K1 (Reduced Tract Acreage)
Surface Water				
Acre-feet of surface-water runoff from pit disturbance and centralized facilities (annual)	0	29	24	14
Acre-feet of water loss from streams (annual)	0	29	24	14
Total miles of streams within 100 feet of transportation route	0	13.8	13.8	13.8
Total miles of perennial streams within 100 feet of transportation route	0	3	3	3
Number of stream crossings	0	118	118	118

Table 4.16.2. Water Resource Impacts under all Alternatives

Disturbance Type	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)	Alternative K1 (Reduced Tract Acreage)
Groundwater				
Acre-feet of groundwater lost for dust suppression (life of the mine)	0	625	525	400
Acre-feet of groundwater lost to evaporation (life of the mine)	0	2,900	4,893	1,856
Annual groundwater interception in mine pits in acre-feet (based on average historical inflow rate observed in Coal Hollow Mine pits of about 20 gpm)	0	32.3	32.3	32.3
Wetlands, Riparian Areas, Floodplains, and Alluvial Valley Floors				
Acres of wetland removal	0	32.5	0.3	0.3
Acres of riparian disturbance	0	11.0	10.1	11.4
Acres of floodplain/AVF disturbance	0	8.0	7.4	9.0
Acres subject to potential subsidence	0	613 (+166 outside the tract)	613 (+166 outside the tract)	613 (+166 outside the tract)

4.16.4.1.1 Kanab Creek

4.16.4.1.1.1 Surface-water Quantity and Use

The results of stream discharge measurements in Kanab Creek indicate that the creek does not gain appreciably as it flows across the tract (see Section 3.16.1.1.1), although discharges from Simpson Hollow Creek and Lower Robinson Creek contribute water to Kanab Creek when flows are present in these drainages. (Potential impacts to surface-water hydrology in these drainages are discussed below.) Kanab Creek usually gains flow as it crosses the irrigated agricultural areas in the private fee coal area immediately east of Block NW. The potential for mine-related activities to impact Kanab Creek surface-water hydrology in this area would be evaluated during the permitting of these lands through the DOGM.

In the Alton Coal Tract, the Kanab Creek stream channel is present only in the no-coal zone and consequently would not be directly disturbed by mine pit disturbances. As discussed in Section 4.16.4.1 above, some decreases in surface-water flows in Kanab Creek would be anticipated as a result of local precipitation and snowmelt runoff waters being held in storm water retention ponds rather than running off to Kanab Creek. However, such impacts would likely be short term (while the sediment controls remain in place) and of relatively small magnitude (the disturbed area at any one time would be small relative to the total surface area of the Kanab Creek drainage). Because under existing conditions, there are no appreciable surface-water gains in Kanab Creek in the tract, and because Kanab Creek would not be directly impacted by the mine pit disturbance, the potential for appreciable diminution of flow rates in the drainage as a result of mine-related activities is low.

Because most of the surface flows from the tract in Kanab and Robinson creeks are impounded in irrigation ponds or lost to stream channel infiltration downstream (Petersen Hydrologic 2007), indirect impacts resulting from any loss of surface waters would primarily affect downstream irrigators rather than instream flows. However, these ponds may be bypassed during infrequent high discharges of stream flow, and any depletion would somewhat decrease peak flows downstream in Kanab Creek.

Potential discharge of mine waters could result in increased flows to Kanab Creek. Discharges of mine waters to Kanab Creek would occur under a UPDES permit administered by the Utah Division of Water Quality. Potential impacts to the hydrologic regime associated with the discharge of mine waters would also be regulated by DOGM. Historically, discharges of mine water from the Coal Hollow Mine have been infrequent and of small magnitude (generally less than 15 gpm) (DOGM 2013a). The quantity of mine water that could be intercepted by the mine pits and subsequently discharged to Kanab Creek would be variable and related to the hydrogeologic conditions encountered in the various mining areas (Petersen Hydrologic 2007).

4.16.4.1.1.2 Surface-water Quality

Kanab Creek and its tributaries from the Arizona state line to the irrigation diversion at the confluence with Reservoir Canyon have recently been included on the Utah State 303(d) list of impaired waters based on exceedances of the 1,200-mg/L TDS standard for irrigation water use. Although the TDS concentrations of Kanab Creek waters are naturally degraded as the stream flows across the tract and adjacent area (see Section 3.16.1.1), significant impacts to water quality in Kanab Creek (including elevated TDS concentrations) resulting from mine-related activities in the tract are not anticipated. Mine pit disturbance would not occur in or adjacent to the Kanab Creek stream channel, which is present only in the no-coal zone within the tract. Runoff from disturbed areas adjacent to Kanab Creek would be captured in retention ponds (which do not release water into downstream receiving waters) or treated with silt fences and other sediment-control BMPs that would minimize the potential for sediments to enter the creek.

As required by SMCRA, the currently operating Coal Hollow Mine (which operates on private fee coal adjacent to the tract) is designed to retain a 10-year 24-hour storm event to prevent discharge during such a storm event. In addition, several sediment retention ponds at the mine site have been enlarged to capture any runoff. Historically, discharges of mine waters through UPDES discharge points have been infrequent (no discharges of mine water have occurred since November 2011). It has been the experience at the Coal Hollow Mine that the largest inflows to the mine pits have occurred where saturated alluvial sediments have been intercepted by the mine pits. The combined sum of inflows from intercepted alluvial groundwater sources in the Coal Hollow Mine have generally been less than approximately 25 gpm at any one time. Groundwater inflows from the Tropic Shale have been minimal (generally less than 1 gpm) or absent in the mine pit areas (DOGM 2013a). Minor seepage from the Smirl Coal Zone also sometimes contributes small quantities of groundwater to the mine pits. Appreciable discharge from the underlying Dakota Formation has not been observed in the mine pit areas. In most mining areas within the Alton Coal Tract, appreciable regions with thick alluvial sediments are not present (see Map 3.10). Consequently, because mine pits in these areas would intersect primarily Tropic Shale bedrock in the overburden, groundwater inflows from the highwall into mine pits should be minor, minimizing the potential need to discharge water from the mine pits through the UPDES discharge points to Kanab Creek (or its tributaries).

4.16.4.1.2 Simpson Hollow Creek

4.16.4.1.2.1 Surface-water Quantity and Use

Sustained surface-water flows in Simpson Hollow Creek are supported from seasonal snowmelt and precipitation runoff, from irrigation return flows from adjacent hay fields, and from groundwaters discharging from springs and seeps in the area. During periods of mining in this drainage, surface-water runoff from disturbed areas would be diverted and captured in storm water retention ponds. Because these waters would be retained and would not be discharged from the ponds, these waters would not enter into Simpson Hollow Creek, resulting in diminished flow rates. Runoff from undisturbed, upgradient areas would be routed in ditches around disturbed areas where the waters would subsequently discharge into Simpson Hollow Creek. Excavation of the mine pits in the upper East Fork of Simpson Hollow Creek (within the coal zone) would remove the stream channel in that area. Obviously, during the period of active mining in that area, surface waters from this tributary would not flow into Simpson Hollow Creek. However, these impacts would be short lived, because after mining in the wash is completed and the land surface is reclaimed to the AOC, surface-water runoff to Simpson Hollow Creek would be restored to near pre-mining conditions. During active mining, the hydrologic connection between the watershed area upstream and downstream from the pits in the East Fork of Simpson Hollow Creek would be retained in a pipe or ditch around the pit areas. This would ensure that runoff from snowmelt and thunderstorms would not impact mining operations. Assuming that irrigation activities on the irrigated fields higher in the drainage are not interrupted during mining operations, irrigation return flows would continue to flow to Simpson Hollow Creek during and after mining operations. If mining activities in the Simpson Hollow Creek resulted in diminution of discharge rates at springs and seeps, this would result in decreased rates of discharge. However, significant impacts to spring discharge rates in this area are not considered likely.

4.16.4.1.2.2 Surface-water Quality

In the pre-mining condition, surface waters in Simpson Hollow Creek, which is a tributary to Kanab Creek, have TDS concentrations that consistently exceed the state irrigation standard (1,200 mg/L), and usually exceed the state stock watering standard (1,200 mg/L) (Petersen Hydrologic 2007). The average TDS concentrations measured at monitoring site SW-15 at the confluence with Kanab Creek in 2012 and 2013 averaged 3,033 mg/L.

The principal sources of water to Simpson Hollow Creek include 1) runoff of snowmelt and precipitation waters from the land surface within the tributary, 2) irrigation return flows (including surface runoff and shallow subsurface interflow runoff) from several large irrigated fields in the drainage area, and 3) groundwater discharge from a series of springs. During the period of mining, surface-water runoff in disturbed areas would be routed into storm water retention ponds and not discharged to the creek, reducing flows in the drainage during periods of snowmelt or intense precipitation. Because the snowmelt and precipitation water would likely be relatively low in TDS, the routing of these waters away from the drainage could result in higher TDS concentrations in the creek. This impact would be short lived because after mining and reclamation in the area are complete, precipitation and snowmelt waters would again flow to the stream. Assuming that irrigation in the upgradient fields continues during mining operations in the drainage at near-current rates, the runoff from these fields would continue to flow to Simpson Hollow Creek, resulting in no significant change in the contribution to TDS from agricultural runoff. Most of the springs in the Simpson Hollow Creek drainage occur in the no-coal zone. Consequently, the potential for impacts to these springs resulting from mining operations is low. However, if impacts to discharge rates at the springs and seeps occurred, the contributions of the impacted spring discharges to the surface-water flows in Simpson Hollow Creek would decrease. Because the TDS concentrations of springs in the Simpson Hollow Creek drainage are variable, this occurrence could result in either an increase or decrease in the TDS concentrations of surface waters in Simpson Hollow Creek, depending on which springs are impacted.

4.16.4.1.3 Lower Robinson Creek

4.16.4.1.3.1 Surface-water Quantity and Use

Coal mining activities in the Lower Robinson Creek drainage could impact surface-water discharge rates in the creek. Surface-water runoff in disturbed areas would be routed into storm water retention ponds and not discharged to the creek, reducing flows in the drainage during periods of snowmelt or intense precipitation. However, because Lower Robinson Creek is ephemeral in the mining areas in the tract, and because water is only rarely present in these reaches of the creek, the magnitude of this potential impact would be small. This impact would also be temporary because after mining and reclamation of the land are complete, surface-water drainage patterns would be restored to the approximate pre-mining condition, and surface-water runoff would again flow into the creek.

The only persistent flow in Lower Robinson Creek is associated with alluvial groundwater seepage that enters the drainage topographically downstream from potential mining areas in the tract (Petersen Hydrologic 2007). Mine pits in upgradient areas could intercept the source(s) of the alluvial groundwater that seeps into the lower reaches of Lower Robinson Creek. Currently, surface-mining activities that have occurred adjacent to Lower Robinson Creek at the Coal Hollow Mine have not resulted in appreciably diminished flows at the alluvial groundwater seepage zone (DOGM 2013a).

4.16.4.1.3.2 Surface-water Quality

In the tract, potential mining locations are present 1) directly north of the existing Coal Hollow Mine workings and west of the Tropic Shale bedrock ridge, and 2) adjacent to the Coal Hollow Mine permit area east of the Tropic Shale bedrock ridge, including portions of upper Sink Valley (see Map 3.10). Where mining occurs west of the Tropic Shale bedrock ridge, it is anticipated that conditions would be generally similar to those encountered during mining on adjacent lands at the Coal Hollow Mine. The mine pits at the currently operating Coal Hollow Mine in adjacent lands west of the Tropic Shale bedrock ridge have encountered modest quantities of groundwater (generally less than approximately 25 gpm in the mine pits at any one time) where saturated alluvial sediments have been intercepted by the mine pits. Discharges of mine water to Lower Robinson Creek through the mine's UPDES discharge locations have been infrequent and of relatively low volume. In the six UPDES discharge events to Lower Robinson Creek that were monitored in 2011, the TDS concentrations of the mine discharge water ranged from 704 to 1,820 mg/L, averaging 1,037 mg/L. The discharge rates at the UPDES discharge points during these events ranged from 1.3 to 15 gpm, averaging 5.4 gpm. The discharges that occurred in 2011 consisted of both surface waters and groundwaters intercepted in the mine pit areas. There have been no UPDES discharges from the Coal Hollow Mine since November 2011, during which time dryer climatic conditions have generally prevailed in the region.

The Smirl Coal Zone in the tract (in the Lower Robinson Creek drainage east of the Tropic Shale bedrock ridge) is present where overburden thickness exceeds 200 feet. If these areas are surface mined, considerable thicknesses of saturated alluvial sediments in Sink Valley could be intercepted in the mine pit highwalls, potentially resulting in large groundwater inflows into the mine pits. Such large inflows of alluvial groundwater could result in the need to discharge considerable quantities of the intercepted alluvial groundwater through the mine's UPDES discharge permit (DOGM 2013a) (Chapter 7 of Coal Hollow Mine MRP). TDS concentrations of alluvial groundwaters in Sink Valley are generally good (< 500 mg/L TDS) and supportive of use for both irrigation and stock watering (DOGM 2013b). The discharge of intercepted alluvial groundwater of this quality to Lower Robinson Creek through UPDES discharge points would not risk causing increases to surface-water TDS in Lower Robinson Creek that would limit its potential use for irrigation or stock watering.

In potential thick-overburden mining areas further north in Block C, alluvial sediments that could support alluvial groundwater systems are much less prevalent (see Map 3.10), and potential recharge for these less-extensive alluvial sediments is generally lacking (as evidenced by the dry hillside, lack of springs, and lack of major surface-water drainages in adjacent upgradient areas). In these mining areas, the potential for the interception of appreciable saturated alluvial sediments in the mine pits is likely considerably lower than it is in the Sink Valley area.

If areas of the tract in the Lower Robinson Creek drainage east of the Tropic Shale bedrock ridge (with overburden thicknesses exceeding 200 feet) are mined using underground-mining techniques, overlying alluvial groundwater systems would likely not be impacted. This is because the presence of soft, low-permeability Tropic Shale bedrock would hydraulically isolate the overlying alluvial groundwaters from the underlying Smirl Coal Zone that lies directly beneath the Tropic Shale. Consequently, discharges of considerable quantities of mine water from the underground workings in these areas would not be anticipated, and thus no significant impacts to water quality in Lower Robinson Creek would be anticipated.

4.16.4.1.4 Ephemeral Washes

4.16.4.1.4.1 Surface-water Quantity and Use

Surface waters are only present in the ephemeral washes in direct response to snowmelt and intense precipitation events. As the land surface in the watershed of an ephemeral wash is disturbed, snowmelt and precipitation runoff waters that would previously have flowed into the ephemeral wash would be routed to storm water retention ponds and not discharged, resulting in diminished flow rates in that wash. This impact would be short lived, however, because once mining and reclamation of the land in the drainage are complete and the surface drainage restored to approximate pre-mining conditions, surface waters would again report to the ephemeral wash.

4.16.4.1.4.2 Surface-water Quality

Ephemeral washes in the tract are commonly deeply incised and unstable in their current configurations (Petersen Hydrologic 2007). Because of these conditions, appreciable erosion of the ephemeral washes and accompanying sediment transport occur during high-discharge events, resulting in elevated TSS concentrations. Interactions with soluble minerals present in these sediments commonly result in increased TDS concentrations (Petersen Hydrologic 2013). Where surface mining locations intersect the ephemeral wash locations, the washes would be excavated by the mine pits. During reclamation of these areas, the washes would be restored to conditions that would likely be at least as stable as the pre-mining condition. Consequently, significant detrimental impacts to water quality in the ephemeral washes (relative to current conditions) would likely not occur.

4.16.4.1.5 Drainage Conditions

4.16.4.1.5.1 Kanab Creek

All of the reaches of Kanab Creek in the tract are in the no-coal zone. Further, there are no potential mining areas within the 100-foot buffer zone for Kanab Creek. Centralized and dispersed facilities would not be constructed in the DOGM-required 100-foot perennial stream buffer zone for Kanab Creek. Any required stream crossings on Kanab Creek would be constructed in accordance with applicable federal and state regulations, which would minimize the potential for impacts to the Kanab Creek stream channel. Accordingly, no appreciable mine-related impacts to the PFC of Kanab Creek in the tract relative to its current condition would be anticipated.

4.16.4.1.5.2 Simpson Hollow Creek

With the exception of portions of the East Fork of Simpson Hollow Creek and the West Fork of Simpson Hollow Creek, the rest of the Simpson Hollow Creek stream channel in the tract is in the no-coal zone and is also outside the limit of pit disturbance. Thus, disturbance of the Simpson Hollow Creek stream channel in these areas by mine pit disturbance would not occur. Those reaches of the East Fork of Simpson Hollow Creek in the coal zone in Block NW would be disturbed by mine-related activities, including the excavation of the mine pits. During mine reclamation activities, if the stream is reconstructed with a properly sized and designed channel, the reconstructed channel could result in a channel that is at least as stable as the existing channel, minimizing the potential for increased sediment transport during high flows. The stream reconstruction would establish a functional stream channel, floodplain, and site-appropriate stabilizing riparian vegetation. Any required stream crossings would be constructed in accordance with applicable federal and state regulations, which would minimize the potential for impacts to the PFC of the stream channel. Accordingly, no appreciable mine-related impacts to the PFC of Simpson Hollow Creek in the tract relative to its current condition would be anticipated.

4.16.4.1.5.3 Lower Robinson Creek

Under the Proposed Action, approximately 0.49 mile of Robinson Creek would be relocated from the tract and diverted into a new human-made channel that is constructed with a bioengineered approach similar to those developed by NRCS and others (Federal Interagency Stream Restoration Workgroup 2001) (see Table 4.16.1). The stream reconstruction would establish a functional stream channel, floodplain, and site-appropriate stabilizing riparian vegetation. Ordinarily, the rerouting of a creek would have direct and indirect impacts to stream function and water quality. However, because Robinson Creek is currently ranked as “Functional – At Risk,” if the stream is rerouted through a properly sized and designed channel, relocation could result in a more stable channel in many areas and therefore less sediment transport during high flows. Nonetheless, where streamside vegetation is removed or where the new channel has less shading, increases in water temperature would occur. This impact would be limited to the lower section of Robinson Creek, because the upper section of Robinson Creek (above the seepage area) is dry most of the time (Petersen Hydrologic 2007). This impact would be minimal during high-flow periods due to the relatively low residence time of the swiftly moving water. The thermal impact could be mitigated through planting riparian vegetation and using materials that mimic a natural stream channel on the rerouted channel. Removal of vegetation would also reduce stream stability locally because there would no longer be root material to hold streambanks in place.

The relocation of the channel would require a State of Utah Stream Alteration Permit and a CWA Section 404 Permit administered by the Department of the Army. Compensatory mitigation for loss of waters of the U.S., sediment controls, and other mitigation would likely be required under these permits. Any loss of channel function remaining after this mitigation would be long term. However, due to the Functional – At Risk status of the stream channel, the level of function could be maintained or improved during temporary relocation or reclamation, particularly with respect to erosion and downstream sedimentation. The design and construction of the relocated channel would be performed under the direction of DOGM, the USACE, and the BLM to optimize the performance of the relocated channel.

4.16.4.1.5.4 Ephemeral Washes

In their current configurations, many of the ephemeral washes in the tract have stream channels that are deeply incised and prone to appreciable erosion during high-discharge events (Petersen Hydrologic 2007). Under the Proposed Action, ephemeral washes would be intercepted by the excavated mine pit areas. During mine reclamation activities, if the ephemeral washes are reconstructed with properly sized and designed channels, the reconstructed channels could result in channels that are as stable as the existing channels, minimizing the potential for increased sediment transport during high flows. Reconstructed washes would need both horizontal and vertical (streambed/gradient controls) stabilization measures to ensure that erosion is not accelerated. Any required crossings of the ephemeral washes would be constructed in accordance with applicable federal and state regulations, which would minimize the potential for impacts to the PFC of the stream channels. Accordingly, no appreciable mine-related impacts to the PFC of the ephemeral washes in the tract relative to current condition would be anticipated.

4.16.4.2 GROUNDWATER

Under the Proposed Action, adverse short-term impacts to groundwater hydrology would occur from groundwater pumping for dust suppression. Groundwater pooled in mining pits could also be used for dust suppression. Water supplies needed for dust suppression are assumed to originate as groundwater. Assuming all the water used for dust suppression is lost to evaporation, the loss of groundwater would be 25 acre-feet per year. Over the approximate 25-year projected life of the mine under this alternative, 625 acre-feet of groundwater would be lost (625 acre-feet more than would be lost under the No Action Alternative; see Table 4.16.2). Assuming no groundwater recharge, this equates to approximately 6% of the first-order approximation of the groundwater resources available (10,000 acre-feet) in the zone from which groundwater resources would be extracted (Petersen 2010).

As described in Section 3.16.2, an attempt was made in the early 1960s to produce groundwater for industrial use from deep, large-diameter wells screened in the Navajo Sandstone in the tract. The wells did not produce sufficient quantities of groundwater for the attempt to be considered even remotely successful (Doelling et al. 1972). Accordingly, it is considered unlikely that groundwater from the Navajo Sandstone would be used for mining purposes in the tract. Therefore, an analysis of potential impacts resulting from pumping of deep groundwater resources is not provided here. As with any surface mining operation, groundwater systems in mine pit areas would obviously be directly impacted from the excavation of the mine pits. Because aquifer systems are generally not present in the Tropic Shale bedrock that overlies the coal zone in the tract (Petersen Hydrologic 2007), impacts of this nature would generally be limited to groundwater systems present in saturated alluvial sediments (which are of limited extent within most of the tract).

Groundwater could be affected by mine-generated subsidence in underground mining areas through changes to groundwater levels, flow, and quality. Because mining produces voids in the strata, these voids induce groundwater movement from the surrounding saturated rock, leading to nearby rock dewatering while water accumulation occurs in the voids. This water movement is often accompanied by rock fracturing or movement, which can change how water moves through the rock, leading to changes in groundwater level, storage capacity, flow direction, and chemistry (Society for Mining 1992). Other potential hydrological impacts from underground mining include changes to the permeability of rock units, creation of fresh rock surfaces, and water flow between previously unconnected units or between surface and groundwater, leading to decreased evapotranspiration in those areas (Marcus 1997).

The bedrock overburden in the underground mining area in the northeast portion of the tract in Block C consists entirely of Tropic Shale (see Map 3.10), which is known to have poor water-transmitting properties (Section 3.16.2). Along the eastern edge of Block C, the Tropic Shale bedrock is capped by a veneer of landslide deposits reported to range from a few feet to 100 feet or more. Alluvial sediments are also present in and near existing drainages (Tilton 2001). No springs or seeps with measurable discharge have been identified in the underground mining area in Block C (Frontier Corporation USA 2012).

In the absence of appreciable groundwater or surface-water resources in the area, there is no significant potential for the underground mining activities to impact important overlying groundwater or surface-water resources. Because of the presence of thick sequences of low-permeability Tropic Shale bedrock in potential underground mining areas, the potential for the downward migration of recharge waters from the land surface through the Tropic Shale to underlying strata is considered low. Because of the lenticular, discontinuous nature of permeable and impermeable strata in the Dakota Formation, the ability for lateral migration of groundwater for appreciable distances is also considered low (Petersen Hydrologic 2007). Consequently, it is considered unlikely that appreciable groundwater systems would be present in Dakota Formation bedrock beneath the mine coal zone in potential underground mining areas.

Based on estimates provided by Petersen (Petersen 2010), approximately 10,000 acre-feet of groundwater are held in storage in the Sink Valley alluvial groundwater system. Groundwater from the Sink Valley alluvial system could be extracted for use in mining operations on the tract. This is a first-order approximation of the available alluvial groundwater resource in Sink Valley that is based on conservative assumptions, including 1) an aerial extent of approximately 1.5 square miles, 2) an average saturated thickness of approximately 45 feet, and 3) an average effective porosity of approximately 0.25. Although tritium and radiocarbon dating of the alluvial groundwaters in Sink Valley indicate modern (post-1951) recharge (Petersen Hydrologic 2007), the rate at which recharge to the alluvial groundwater system occurs has not been determined.

Extraction of the coal resource would remove any water associated with the mined coal zone itself, including any groundwater present in pore spaces of the coal zone as well as the inherent moisture of the coal itself. Based on the experience at the existing Coal Hollow Mine, where only minor quantities of groundwater have been encountered in the mined coal zone, it is considered likely that only similarly small quantities of groundwater would be removed from the pore spaces in the coal zone during mining operations. The inherent moisture bound to the coal deposits would, of necessity, be removed with the coal during mining operations. With an average projected annual coal production of 2 million tons, the loss of moisture from coal would be 209 acre-feet per year. Most or all of this moisture is physically or chemically bound to the coal itself, and as such, it does not constitute a groundwater resource. Because the inherent coal moisture does not substantively contribute to groundwater or surface-water systems in the area, the extraction of the coal's inherent moisture would not result in any significant impact to the hydrologic balance.

A portion of groundwater pooled in mining pits that is not removed for dust suppression would be lost to evaporation and would represent a groundwater loss. Under the Proposed Action, up to 40 acres of groundwater would be exposed to evaporation at any one time. The average annual evaporation from standing water in the tract is approximately 35 inches (based on evaporation data available for Bryce Canyon National Park from 1971 to 1978). Therefore, the loss of groundwater from mining pits due to evaporation would be up to 116 acre-feet per year. Under this alternative, over the life of the mine, the total loss of groundwater due to evaporation from mining pits would be up to 2,900 acre-feet (2,900 acre-feet more than under the No Action Alternative; see Table 4.16.2). This estimate assumes that there would be one open pit (approximately 40 total acres) for the life of the mine. However, there would be one open pit only for the surface mining portion of the total mine life. For the underground mining portion of the mine life, there would not be any open pits and therefore no exposed groundwater as a result of mining. However, some groundwater would still be lost as a result of groundwater evaporation through underground mine openings.

Assuming that future water use rates for mining operations in the tract are similar to those currently being used at the existing Coal Hollow Mine, it would be anticipated that the use rate would not exceed approximately 25 acre-feet per year. If the source of this water is the Sink Valley alluvial groundwater system, this would represent approximately ¼ of 1% of the 10,000 acre-feet in storage per year. Because the rate of recharge to the alluvial groundwater system is not known, it is not known whether the long-term extraction of 25 acre-feet per year (equal to a continuous extraction rate of 15.5 gpm) would result in significant depletion of the alluvial groundwater storage in Sink Valley. However, based on the relatively small well production rates proposed, this seems unlikely.

The actual source(s) of water that would be used during mining operations at the tract would be determined by the eventual successful bidder for the Alton Coal Tract. Any appropriations of water for such use would be controlled by the Utah Division of Water Rights. Impacts to the hydrologic balance that could result from the use of the designated water source(s) would be evaluated and regulated during the mine permitting process by DOGM. As indicated previously, no appreciable aquifer systems are believed to be present in the Tropic Shale bedrock in the tract. Thus, because of the absence of aquifers in the Tropic Shale, significant mine-related impacts to groundwater systems in that geologic formation would not be expected. Due to the poor groundwater-transmitting properties of the Dakota Formation (Petersen Hydrologic 2007), it is assumed that no degradation to deeper aquifers would occur.

The town of Alton holds State of Utah–appropriated water rights for municipal use. The water sources associated with these water rights include Birch Springs, located in Birch Canyon approximately 2.5 miles north of the tract; Seegmiller Springs, located more than 2 miles northeast of the tract; and a groundwater well approximately 0.8 mile north of the tract. Birch Springs discharges from the Brian Head Formation in upland areas that are isolated from the tract by the Sevier fault zone (see Section 3.6.3). Seegmiller Springs discharges from hillsides near the base of the Straight Cliffs Formation in the Kanab Creek valley. Because of the appreciable distances of these springs from the tract, and because these springs discharge from strata that are not present in the tract, water quality and water quantity at these springs should not be impacted by the mine-related activities in the tract. The alluvial well is reported to be 100 feet deep and screened in alluvial gravels situated near Kanab Creek (Utah Division of Water Rights 2014). Because the well is a considerable distance upgradient from the tract, and because mining within the Kanab Creek alluvium near the well is not proposed, the potential for impacts to water quantity or water quality at this well would be considered low. There are also no stock-watering wells in the tract, thus, none would be affected.

Due to the appreciable distances between springs used by the town of Alton and the tract, and because these springs discharge from strata that are not present in the tract, water quality and water quantity at these springs should not be impacted by the Proposed Action. The town of Alton’s alluvial water well is reported to be 100 feet deep and screened in the alluvial sediments associated with Kanab Creek (Utah Division of Water Rights 2014). Because the well is a considerable distance upgradient from the tract, and because mining in the Kanab Creek alluvium near the well is not proposed, the potential for impacts to water quantity or water quality at this well would be considered very unlikely.

Based on laboratory analysis of samples collected in the Alton area but not directly in the tract, acid-forming and toxic-forming materials that could result in the contamination of groundwater supplies in the tract are generally not present (Petersen Hydrologic 2007). As part of the permitting process, DOGM requires permittees to pre-sample overburden for acid-forming and toxic-forming substances. In the event that either of these is discovered, the permittee would be required to develop a plan to treat these substances to minimize or eliminate impacts to groundwater quality.

Discussions of the potential for impacts to groundwater occurrence, use, hydrology, and quality in individual portions of the tract are presented in the subsections below.

4.16.4.2.1 Block C

4.16.4.2.1.1 Groundwater Occurrence, Use, and Hydrology

Shallow alluvial groundwater systems in Block C are likely recharged primarily by mountain front recharge mechanisms along the western flanks of the Paunsaugunt Plateau. In the southern portion of Block C (near Lower Robinson Creek), the primary recharge areas are in areas that are laterally removed and topographically upgradient of the tract (Petersen Hydrologic 2007). Therefore, no adverse impacts to groundwater quantity would be expected to occur in these areas from reduced recharge associated with the Proposed Action. In the central and northern portions of Block C, the primary mountain front recharge areas for shallow alluvial groundwater systems are in the tract along the eastern edge of Block C. Surface mining in these areas could disrupt the recharge to downgradient alluvial groundwater systems. Natural discharges from the alluvial groundwater systems in Block C are limited to a single seep (SP-39, which discharges at 0.05 gpm or less) and an alluvial groundwater seepage zone in the lower reaches of Lower

Robinson Creek (which commonly discharges at approximately 7 gpm or less). No springs, seeps, or perennial or intermittent stream reaches (other than Kanab Creek) have been identified in the central and northern portions of Block C (Frontier Corporation USA 2012). Where shallow alluvial groundwater systems are present in alluvial sediments in proposed mining areas, these systems would obviously be directly impacted as a result of the excavation of the alluvial sediments by the mine pits. However, other than SP-39 and the Lower Robinson Creek alluvial groundwater seepage zone, no springs or perennial or intermittent stream reaches or other natural expressions of groundwater discharge have been identified in the area. Therefore, the potential for impacts to groundwater resources is not appreciable. Based on stream gain/loss studies performed in Kanab Creek during low-flow conditions (see Figure 3.16.4), there is apparently no appreciable baseflow contribution to flows in Kanab Creek derived from the Block C area (other than the minor seepage sometimes present in Lower Robinson Creek). Accordingly, potential interception of upgradient alluvial groundwater systems in Block C would not result in significant adverse impacts to water quantity in Kanab Creek.

4.16.4.2.1.2 Groundwater Quality

Natural discharges from the alluvial groundwater systems in Block C are limited to a single seep (SP-39, which discharges at 0.05 gpm or less) and an alluvial groundwater seepage zone in the lower reaches of Lower Robinson Creek (which commonly discharges at approximately 7 gpm or less). No springs, seeps, or perennial or intermittent stream reaches (other than Kanab Creek) have been identified in the central and northern portions of Block C (Frontier Corporation USA 2012). Other than the alluvial seepage in Lower Robinson Creek, there is no identified groundwater-derived contribution to the baseflow in Kanab Creek from the Block C area (Section 3.16.2.1.1). Potential mechanisms by which significant impacts to the quality of groundwater resources would be likely have not been identified in Block C. Accordingly; impacts to groundwater quality are not anticipated.

4.16.4.2.2 Block NW

4.16.4.2.2.1 Groundwater Occurrence, Use, and Hydrology

Of the eight springs/seeps monitored in and immediately adjacent to Block NW, all but one (Seep 4) discharge from the no-coal zone. Consequently, the discharge areas for these springs/seeps would not be from mining operations in Block NW. The precise groundwater flow paths that convey the groundwater from recharge areas to the spring locations are not known. Consequently, it is not known whether mining in surrounding areas in Block NW could intercept these groundwater flow paths. If the groundwater flow paths are intercepted, diminished discharge rates at the springs would be anticipated. However, because of the presence of the low-permeability Tropic Shale bedrock that overlies the coal zone in potential mining areas, the potential for vertical recharge to deeper groundwater systems through this formation is considered minimal. Consequently, it is unlikely that the primary recharge areas for these springs would occur in potential mine pits disturbance areas within the coal zone. Thus, the potential for mining operations in Block NW to adversely impact flow rates at these springs is low.

Further investigation of the recharge areas, groundwater flow paths, and discharge mechanisms for these springs would be performed as part of the mine permitting process through DOGM. Seep 2 is a minor seepage area in the Smirl Coal Zone a short distance below adjacent irrigated agricultural fields in Block NW (see Map 3.17). This seep discharges at low rates (< 0.25 gpm) with high TDS concentrations (> 12,000 mg/L) from shallow, weathered Tropic Shale–derived sediments and soils. Because this seep is in the Smirl Coal Zone, the seep could be intercepted by the mine pits during mining in Block NW.

Although springs, seeps, wetlands, and flowing stream reaches are present in the western three-quarters of Block NW, such features are mostly absent in the eastern quarter of Block NW. In the eastern quadrant of Block NW, Tropic Shale bedrock or a thin veneer of alluvial sediments is present at the land surface.

4.16.4.2.2.2 Groundwater Quality

Most springs and seeps in Block NW discharge from the no-coal zone and consequently would not be directly disturbed by mining activities. Because of the low potential for appreciable groundwater flow through the Tropic Shale bedrock, it is unlikely that groundwater recharge or flow path areas would be intercepted by surface-mining operations in the Smirl Coal Zone. Consequently, because it is unlikely that either the primary groundwater recharge areas or the discharge locations would be disturbed by mining operations, the potential for significant impacts to the quality of groundwater in Block NW is low.

4.16.4.2.3 Blocks CWN and CWS

4.16.4.2.3.1 Groundwater Occurrence, Use, and Hydrology

No springs with visible or measurable discharge have been identified in Block CWS. A single seepage area (SP-41) is present in the no-coal zone adjacent to Block CWS. Measurable discharge from SP-41 has not been observed. Similarly, a single seep (Seep 1) has been identified adjacent to Block CWN in the no-coal zone. Measurable discharge at Seep 1 has not been observed, although stagnant puddles are usually present. No perennial or intermittent stream reaches have been identified in either Blocks CWN or CWS. The Alton Mine, which was first operated in the 1960s in Block CWS (and has since been reclaimed), was noted as being a dry mine (Doelling et al. 1972). Because there are no appreciable groundwater or surface-water resources in Blocks CWN and CWS, there is no potential for significant impacts to groundwater or surface-water discharge rates as a result of the Proposed Action.

4.16.4.2.3.2 Groundwater Quality

There are no appreciable groundwater resources identified in Blocks CWN and CWS. Accordingly, there are no anticipated water-quality impacts to groundwater resources.

4.16.4.2.4 Blocks S and Sa

4.16.4.2.4.1 Groundwater Occurrence, Use, and Hydrology

Only one spring has been identified in Blocks S and Sa. SP-38 seeps from weathered clayey sediments in the no-coal zone in Block Sa (see Map 3.17). Measureable discharge from SP-38 is rarely present, and when present is typically less than 1 gpm (Petersen Hydrologic 2013). The quality of the groundwater monitored at SP-38 when it is present (usually in small stagnant pools) has ranged from 4,400 to 14,900 mg/L TDS, limiting its potential for use for irrigation or stock watering. There are no perennial or intermittent stream reaches in Blocks S or Sa. Because there are no appreciable groundwater resources in Blocks S and Sa, the potential for adverse impacts to groundwater discharge rates within these blocks as a result of the Proposed Action is low.

An additional seep (SP-27) discharges from private lands near the border between the private lands and the Block S and Sa area (see Map 3.17). Discharge from SP-27 has only rarely been observed, and the spring area is usually dry (Petersen Hydrologic 2013). On the two occasions when sufficient discharge was present at SP-27 to collect a groundwater sample, the TDS concentrations of the water ranged from 3,780 to 6,550 mg/L, which limits its potential use for stock watering or irrigation purposes. Mining associated with the Proposed Action would intercept the seep area with the mine pits. Additional springs and seeps have been identified in alluvial groundwater systems on private lands in Sink Valley east of Blocks S and Sa (Petersen Hydrologic 2007). The potential for discharge rates from these springs to be impacted by nearby coal mining operations at the existing Coal Hollow Mine has been previously evaluated in conjunction with mine permitting activities at the Coal Hollow Mine (DOGM 2013a).

4.16.4.2.4.2 Groundwater Quality

No appreciable or developable groundwater resources are known to be present in Blocks S and Sa. With the exceptions of SP-38 (with measured TDS concentrations ranging from 4,400 to 14,900 mg/L, and discharge rates of less than 1 gpm) and SP-27 (with measured TDS concentrations ranging from 3,780 to 6,550 mg/L, and discharge rates of less than 1 gpm), no appreciable groundwater discharge (as expressed by springs or seeps) has been observed in Blocks S and Sa. Because of the general lack of groundwaters and the poor water quality of the two seeps, there is expected to be no appreciable risk of impacting the quality of groundwater resources within Blocks S and Sa.

4.16.4.3 WETLANDS, RIPARIAN AREAS, FLOODPLAINS, AND ALLUVIAL VALLEY FLOORS

Under the Proposed Action, approximately 32.5 acres of wetlands in the tract identified in a 2012 delineation report would be removed from surface-mining operations, compared to none under the No Action Alternative (see Table 4.16.2) (Frontier Corporation USA 2012). This is approximately 60% of the total 54.0 acres of wetlands in the tract. Approximately 30.0 acres (92.3%) of the 32.5 acres of wetlands removed are irrigated wet meadow habitat type in Block NW. Approximately 2.4 acres (7.4%) of the 32.5 acres of wetlands removed are riparian wet meadow habitat type in Block NW. Approximately 0.1 acre of riparian wet meadow habitat type would be impacted from the relocation of KFO Route 116 under the Proposed Action. In the short term, the functions performed by these wetlands would be lost with the removal of the wetland areas. Riparian wet meadow areas tend to be heavily grazed. Spring runoff, surface drainage, and a seasonally high water table appear to be the main sources of hydrology for these wetlands. Irrigated wet meadow areas are slope wetlands found in association with drainage coming off irrigated alfalfa fields in Block NW. Irrigation return flows, natural surface drainage, and a seasonally high water table appear to be the main sources of hydrology for these wetlands. Mixed riparian, scrub-shrub/wet meadow areas were identified along the south reach of Kanab Creek. Seasonal flooding and near-surface groundwater associated with the alluvial aquifer appear to be the main sources of hydrology for these wetlands. Reclamation would partially or fully restore the wetland functions lost; however, the precise pre-mining structure, extent, and character of the wetlands would be permanently altered. Assuming these wetlands are jurisdictional, the successful bidder would be required to complete a functional assessment and mitigate wetland impacts in accordance with guidance and directives provided by USACE during the CWA Section 404 permitting process.

Under the Proposed Action, total disturbance to riparian areas would be 11.0 acres (see Table 4.16.2). Of this total, 3.8 acres of disturbance would result from surface mining. Direct impacts from the relocation of KFO Route 116 would be from the removal of 0.5 acre of riparian area. Assuming that impacts from dispersed facilities (160 acres) are proportional to the acreage of riparian areas present in the no-coal zone (where all dispersed facilities are assumed to be located), approximately 6.7 acres of riparian area would be lost from the construction of these facilities. Under the Proposed Action, the total disturbance to riparian areas of 11.0 acres would be 11.0 acres more disturbance than under the No Action Alternative. The impacts from disturbance or removal of riparian areas would depend on the quality of the existing habitat and the reclamation that followed the disturbance. Impacts could include loss of native vegetation, loss of wildlife habitat, destabilization of the associated streambanks, loss of habitat for fish and other aquatic life, lowering of the water table, and erosion.

Under the Proposed Action, all floodplains/terraces (57 acres) and probable AVFs (57 acres) present on the tract occur in the no-coal zone. Though these acreagese would not be directly impacted from pit disturbance, direct impacts would result from construction of dispersed facilities and relocation of KFO Route 116. The floodplains/AVFs make up approximately 5.0% of the total no-coal zone area available for dispersed facilities (1,131 acres) under the Proposed Action. Assuming that impacts from dispersed facilities (160 acres) are proportional to the acreage of floodplains/AVFs present in the no-coal zone, approximately 8 acres of floodplains/AVFs could be impacted under the Proposed Action (8 acres more disturbance of floodplains/AVFs areas than under the No Action Alternative; see Table 4.16.2). Approximately 60,565 linear feet of ephemeral and intermittent drainages are within the surface mining areas of the coal zone associated with this alternative. Approximately 17,102 linear feet of perennial (including 96 linear feet of Kanab Creek), intermittent, and ephemeral drainages are within the underground mining area. In surface mining areas, any riparian and floodplain character would be lost for the duration of mining. Post-mining restoration of drainages and related success criteria would be determined during the DOGM permitting process in these areas. In the absence of appreciable groundwater or surface-water resources in the area, there is no significant potential for the underground mining activities to impact important overlying surface-water resources.

The requirements to protect AVFs refer to protecting the essential hydrologic function of AVFs as they relate to the ability to conduct farming at the AVF. In the six areas delineated as probable AVFs (including the 8 acres that would be impacted under the Proposed Action), the essential hydrologic function is related to the ability of the land to be irrigated using surface water sourced from either Kanab Creek or Sink Valley Wash. Groundwater availability is not a significant factor in the essential hydrologic functions of any these probable AVFs (there is no groundwater-derived baseflow component of discharge in Sink Valley Wash that flows to the probable AVF in lower Sink Valley Wash) (Petersen Hydrologic 2008). Accordingly, the only reasonably plausible way that the essential hydrologic functions of these AVFs could be impacted would be if impacts to water quantity or water quality in Kanab Creek or lower Sink Valley Wash were to occur (these are discussed above). Because the probable AVFs are in no-coal areas, and thus would not be mined, the physical capability of the land to be irrigated would not be impacted outside of the construction of dispersed facilities and relocation of KFO Route 116 in these areas (approximately 207 acres, and no more than 57 acres, which is the total area of probable AVFs in the tract). Development of floodplains would result in the loss of their functions and values in these areas (approximately 8 acres; see Table 4.16.2). Floodplain functions that could be lost include flood storage and attenuation, riparian habitat (described above), groundwater recharge, water filtration, and erosion prevention.

4.16.5 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Under Alternative C, the tract would be modified to exclude Block NW (see Map 2.2). Further, certain mining activities in the tract's southern portion (Block S) would be subject to seasonal restrictions to reduce impacts to the local sage-grouse population. Under Alternative C, the modified tract would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the tract. The boundaries of the modified tract would be reasonably consistent with the configuration shown in Map 2.2.

Approximately 1,662 acres of surface disturbance would occur in the Alton Coal Tract under Alternative C (see Table 4.16.1). As under the Proposed Action, underground mining would occur on 613 acres of land in the tract under Alternative C.

4.16.5.1 SURFACE WATER

Impacts to surface-water quantity under Alternative C would be of the same nature as those under the Proposed Action, but would be of lesser magnitude. Under this alternative, 1,490 acres of the tract would be disturbed by surface mining and the construction of centralized facilities (1,490 acres more than would be disturbed under the No Action Alternative). Runoff from 1,490 acres (1.3% of the area draining to the USGS gauge) would be diverted and captured in storm water retention ponds to reduce the amount of eroded sediments discharged to downstream water bodies such as Kanab Creek and Robinson Creek.

Under Alternative C, approximately 24 acre-feet of water would be captured from disturbed areas (24 more acre-feet than under the No Action Alternative; see Table 4.16.2). Areas where runoff would not be captured (the road relocation ROW and dispersed facilities) would be treated through the use of silt fencing, check dams (e.g., straw bales), or other BMPs that slow runoff and allow sediments to settle. As discussed for the Proposed Action, this water would be removed from the surface-water system due to infiltration and evaporation.

Impacts to surface-water quality under Alternative C would be of the same nature as those under the Proposed Action, but would be of a lesser magnitude. Under Alternative C, approximately 24 acre-feet of water would be captured from disturbed areas (see Table 4.16.2). This quantity of water would no longer reach receiving waters downstream, resulting in reduced dilution and therefore a potential increase in the concentration of pollutants in associated surface waters compared to the No Action Alternative.

Adverse impacts along the coal haul transportation route would be the same as those described under the Proposed Action, but would occur for approximately 21 years rather than approximately 25 years.

4.16.5.1.1 Kanab Creek, Lower Robinson Creek, and Ephemeral Washes

4.16.5.1.1.1 Surface-water Quantity and Use

Impacts to the hydrology of these drainages would be the same as those under the Proposed Action. However, there would be no impact to the hydrology of ephemeral washes in Block NW, because there would be no mining in Block NW.

4.16.5.1.1.2 Surface-water Quality

Impacts to surface-water quality in these drainages would be the same as those under the Proposed Action. However, there would be no impact to the quality of ephemeral washes in Block NW, because there would be no mining in Block NW.

4.16.5.1.2 Simpson Hollow Creek

4.16.5.1.2.1 Surface-water Quantity and Use

Under Alternative C, no significant impacts to surface-water hydrology in Simpson Hollow Creek would be anticipated. Because mining activities in a headwaters area for Simpson Hollow Creek in Block NW would not occur, no impacts to surface-water hydrology would be anticipated.

4.16.5.1.2.2 Surface-water Quality

Changes to TDS concentrations to Simpson Hollow Creek potentially resulting from decreased flow rates from springs and seeps in Block NW would not occur because the area would not be mined (although the potential for this occurrence is considered low under the No Action Alternative). Loss of surface-water runoff in Simpson Hollow Creek resulting from the impoundment and retention of surface-water runoff within disturbed areas in Block NW would not occur.

4.16.5.1.3 Drainage Condition

4.16.5.1.3.1 Kanab Creek

Impacts to the drainage condition of Kanab Creek under Alternative C would be the same as those under the Proposed Action.

4.16.5.1.3.2 Simpson Hollow Creek

Under Alternative C, the primary source areas for Simpson Hollow Creek would not experience mining. No appreciable impacts to drainage condition would be anticipated as a result of the Proposed Action. Similarly, no appreciable impacts to drainage condition would be anticipated under Alternative C.

4.16.5.1.3.3 Lower Robinson Creek

Under Alternative C, approximately 0.49 mile of Robinson Creek would be relocated from the area that would be surface mined into a new human-made channel hardened with riprap (see Table 4.16.1). This is the same length as would be relocated under the Proposed Action. Thus, Alternative C would have the same direct and indirect impacts to drainage condition and water quality as described under the Proposed Action.

4.16.5.1.3.4 Ephemeral Washes

There would be no change relative to Proposed Action, although any ephemeral washes present in Block NW would not be impacted by mining activities.

4.16.5.2 GROUNDWATER

Impacts to groundwater hydrology under Alternative C would be the same as those under the Proposed Action but would be of a lesser magnitude. Over the approximate 21-year life of the mine under Alternative C, groundwater losses for dust suppression would be approximately 525 acre-feet (525 more acre-feet than under the No Action Alternative; see Table 4.16.2). Assuming no groundwater recharge, this equates to approximately 5% of the estimated groundwater resources available (10,000 acre-feet) in the zone from which groundwater resources would be extracted (Petersen 2010).

Groundwater losses from the removal of coal moisture would also occur under Alternative C, with 3,981 acre-feet of moisture lost (3,981 acre-feet more than would occur under the No Action Alternative) over the life of the mine (see Table 4.16.2). However, as explained in Section 4.16.4.2, most or all of this moisture is physically or chemically bound to the coal itself, and as such, it does not constitute a usable groundwater resource.

Groundwater pooled in mining pits that is not removed for dust suppression would be lost to evaporation and would represent a groundwater loss. Under Alternative C, up to 80 acres of groundwater would be exposed to evaporation at any one time. The maximum annual evaporation from standing water in the tract is approximately 35 inches per year. Therefore, the loss of groundwater from mining pits from evaporation would be up to 233 acre-feet per year. Under this alternative, over the life of the mine, the total loss of groundwater due to evaporation from mining pits would be up to 4,893 acre-feet (4,893 acre-feet more than under the No Action Alternative; see Table 4.16.2). This estimate assumes that there would be two open pits (approximately 80 total acres) for the life of the mine. However, there would be two open pits only for a portion of the total mine life to comply with the timing restrictions of this alternative. Following this time frame, up to 40 acres of groundwater would be exposed as a result of pooling in mining pits (one open pit). Further, for the underground mining portion of the mine life, there would not be any open pits and therefore no exposed groundwater as a result of mining. However, some groundwater would still be lost as a result of evaporation through underground mine openings. Also, if the underground mine discharges water to a settling pond, then some evaporation would occur there.

Potential degradation to deeper aquifers (and therefore impacts to municipal water supplies) and potential impacts to groundwater resources as a result of acid-forming and toxic-forming materials would be the same under Alternative C as under the Proposed Action.

Subsidence-related water resources impacts from underground mining under Alternative C would be of the same nature and magnitude as those for the Proposed Action, because the area that would be underground mined under Alternative C would also be underground mined under the Proposed Action.

4.16.5.2.1 Blocks C, CWN, CWS, S, and Sa

4.16.5.2.1.1 Groundwater Occurrence, Use, and Hydrology

Impacts to groundwater hydrology under Alternative C would be the same as those under the Proposed Action.

4.16.5.2.1.2 Groundwater Quality

Impacts to groundwater quality under Alternative C would be the same as those under the Proposed Action.

4.16.5.2.2 Block NW

4.16.5.2.2.1 Groundwater Occurrence, Use and Hydrology

There would be no impacts to groundwater hydrology under Alternative C, because there would be no mining in Block NW.

4.16.5.2.2.2 Groundwater Quality

There would be no impacts to groundwater quality under Alternative C, because there would be no mining in Block NW.

4.16.5.3 WETLANDS, RIPARIAN AREAS, FLOODPLAINS, AND ALLUVIAL VALLEY FLOORS

Under Alternative C, the irrigated wet meadow wetlands (30 acres) in Block NW that would be impacted under the Proposed Action would not be disturbed as a function of mining because this portion of the tract would not be included in a lease sale under this alternative (see Table 4.16.2). Approximately 0.03 acre of riparian wet meadow wetlands would be impacted by relocation of KFO Route 116 under Alternative C.

Under the Alternative C, total disturbance to riparian areas would be 10.1 acres (see Table 4.16.2). Of this total, 3.7 acres would be disturbed from surface mining. Direct impacts from the relocation of KFO Route 116 would be from the removal of 0.3 acre of riparian area. Assuming that impacts from dispersed facilities (135 acres) are proportional to the acreage of riparian areas present in the no-coal zone (where all dispersed facilities are assumed to be located), approximately 6.1 acres of riparian area would be disturbed from the construction of these facilities. Under Alternative C, the total disturbance to riparian areas of 10.1 acres would be 10.1 acres more disturbance than under the No Action

Alternative. As under the Proposed Action, the impacts due to disturbance or removal of riparian areas would depend on the quality of the existing habitat and the reclamation that followed the disturbance. Impacts would include loss of native vegetation, loss of wildlife habitat, and destabilization of the associated streambanks.

Under Alternative C, all floodplains/terraces (57 acres) and probable AVFs (57 acres) present on the tract occur in the no-coal zone. Though this acreage would not be directly impacted from pit disturbance, direct impacts would result from construction of dispersed facilities and relocation of KFO Route 116. The nature of these impacts would be the same under Alternative C as under the Proposed Action. The floodplains/AVFs make up approximately 5.5% of the total no-coal zone area available for dispersed facilities (1,034 acres). Assuming that impacts from dispersed facilities (135 acres) are proportional to the acreage of floodplains/AVFs present in the no-coal zone, approximately 7.4 acres of floodplain/AVF area would receive surface disturbance under Alternative C (7.4 acres more disturbance of floodplain/AVF area than under the No Action Alternative; see Table 4.16.2). Approximately 52,660 linear feet of ephemeral and intermittent drainages are within the surface mining areas of the coal zone associated with this alternative. Approximately 17,102 linear feet of intermittent and ephemeral drainages are within the underground mining area. In surface mining areas, any riparian and floodplain character would be lost for the duration of mining. Post-mining restoration of drainages and related success criteria would be determined during the DOGM permitting process in these areas. In the absence of appreciable groundwater or surface-water resources in the area, there is no significant potential for the underground mining activities to impact important overlying surface-water resources.

4.16.6 Alternative K1: Reduced Tract Acreage

Under Alternative K1, the tract would be modified to exclude Block NW and Block S (see Map 2.3). Under Alternative K1, the modified tract would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the tract. The boundaries of the modified tract would be reasonably consistent with the configuration shown in Map 2.3.

Approximately 1,012 acres of surface disturbance would occur in the Alton Coal Tract under Alternative K1 (see Table 4.16.1). As under the Proposed Action and Alternative C, underground mining would occur on 613 acres of land in the tract under Alternative K1.

4.16.6.1 SURFACE WATER

Impacts to surface-water quantity under Alternative K1 would be of the same nature as those under the Proposed Action and Alternative C, but would be of lesser magnitude. Under this alternative, 905 acres of the tract would be disturbed by surface mining and the construction of centralized facilities (905 acres more than would be disturbed under the No Action Alternative). Runoff from 905 acres (0.8% of the area draining to the USGS gauge) would be diverted and captured in storm water retention ponds to reduce the amount of eroded sediments that are discharged to downstream water bodies such as Kanab Creek and Robinson Creek. Under Alternative K1, approximately 14 acre-feet of water would be captured from disturbed areas (14 more acre-feet than under the No Action Alternative; see Table 4.16.2). Areas where runoff would not be captured (the road relocation ROW and dispersed facilities) would be treated through the use of silt fencing, check dams (e.g., straw bales), or other BMPs that slow runoff and allow sediments to settle. As discussed for the Proposed Action, this water would be removed from the surface-water system due to infiltration and evaporation.

Impacts to surface-water quality under Alternative K1 would be the same as those under the Proposed Action but would be of a lesser magnitude. Under Alternative K1, approximately 14 acre-feet of water would be captured from disturbed areas (see Table 4.16.2). This quantity of water would no longer reach receiving waters downstream, resulting in reduced dilution and therefore a potential increase in the concentration of pollutants in associated surface waters compared to the No Action Alternative.

Adverse impacts along the coal haul transportation route would be the same as those described under the Proposed Action, but would occur for approximately 16 years rather than approximately 25 years.

4.16.6.1.1 Kanab Creek, Simpson Hollow Creek, and Lower Robinson Creek

4.16.6.1.1.1 Surface-water Quantity and Use

Impacts to surface-water hydrology of Kanab Creek, Simpson Hollow Creek, and Lower Robinson Creek under Alternative K1 would be the same as those under Alternative C.

4.16.6.1.1.2 Surface-water Quality

Impacts to surface-water quality of Kanab Creek, Simpson Hollow Creek, and Lower Robinson Creek under Alternative K1 would be the same as those under Alternative C.

4.16.6.1.2 Ephemeral Washes

4.16.6.1.2.1 Surface-water Quantity and Use

Impacts to surface-water hydrology of ephemeral washes under Alternative K1 would be the same as those under Alternative C.

4.16.6.1.2.2 Surface-water Quality

Impacts to water quality of ephemeral washes under Alternative K1 would be the same as the impacts under Alternative C, except ephemeral washes in Block S would not be impacted because there would be no mining in Block S.

4.16.6.1.3 Drainage Conditions

4.16.6.1.3.1 Kanab Creek, Simpson Hollow Creek, and Lower Robinson Creek

Impacts to PFC of Kanab Creek, Simpson Hollow Creek, and Lower Robinson Creek under Alternative K1 would be the same as those under Alternative C.

4.16.6.1.3.2 Ephemeral Washes

Impacts to the stream channel stability of ephemeral washes under Alternative K1 would be the same as those under Alternative C, except ephemeral washes in Block S would not be impacted because there would be no mining in Block S.

4.16.6.2 GROUNDWATER

Impacts to groundwater hydrology under Alternative K1 would be the same as those under the Proposed Action but would be of a lesser magnitude. Over the approximate 16-year life of the mine under Alternative K1, groundwater losses for dust suppression would be approximately 400 acre-feet (400 more acre-feet than under the No Action Alternative; see Table 4.16.2). Assuming no groundwater recharge, this equates to approximately 4% of the estimated groundwater resources available (10,000 acre-feet) in the zone from which groundwater resources would be extracted (Petersen 2010).

Groundwater losses from the removal of coal moisture would also occur under Alternative K1, with 3,135 acre-feet of moisture lost (3,135 acre-feet more than would occur under the No Action Alternative) over the life of the mine (see Table 4.16.2). However, as explained in Section 4.16.4.2, most or all of this moisture is physically or chemically bound to the coal itself, and as such, it does not constitute a usable groundwater resource.

Groundwater pooled in mining pits not removed for dust suppression would be lost to evaporation and represents a groundwater loss. Under Alternative K1, up to 40 acres of groundwater would be exposed to evaporation at any one time. The maximum annual evaporation from standing water in the tract is approximately 35 inches per year. Therefore, the loss of groundwater from mining pits due to evaporation would be up to 116 acre-feet per year. Under this alternative, over the life of the mine, the total loss of groundwater due to evaporation from mining pits would be up to 1,856 acre-feet (1,856 acre-feet more than under the No Action Alternative; see Table 4.16.2). This estimate assumes that there would be one open pit (approximately 40 total acres) for the life of the mine. During underground mining, some groundwater would be lost as a result of evaporation through underground mine openings (i.e., evaporation from mine ventilation). If the underground mine discharges water to a settling pond, then some evaporation would occur there.

Potential degradation to deeper aquifers (and therefore impacts to municipal water supplies) and potential impacts to groundwater resources as a result of acid-forming and toxic-forming materials would be the same under Alternative K1 as under the Proposed Action.

Subsidence-related water resources impacts from underground mining under Alternative K1 would be of the same nature and magnitude as those under the Proposed Action, because the area that would be underground mined under Alternative K1 would also be underground mined under the Proposed Action.

4.16.6.2.1 Blocks C, NW, CWN, and CWS

4.16.6.2.1.1 Groundwater Occurrence, Use, and Hydrology

Impacts to groundwater hydrology under Alternative K1 would be the same as those under Alternative C.

4.16.6.2.1.2 Groundwater Quality

Impacts to groundwater quality under Alternative K1 would be the same as those under Alternative C.

4.16.6.2.2 Blocks S and Sa

4.16.6.2.2.1 Groundwater Occurrence, Use, and Hydrology

Impacts to groundwater hydrology under Alternative K1 would be the same as the impacts under Alternative C, except seeps SP-27 and SP-38 would not be disturbed by mining activities.

4.16.6.2.2.2 Groundwater Quality

Impacts to groundwater quality under Alternative K1 would be the same as those under Alternative C, except seeps SP-27 and SP-38 would not be disturbed by mining activities.

4.16.6.3 WETLANDS, RIPARIAN AREAS, FLOODPLAINS, AND ALLUVIAL VALLEY FLOORS

Under Alternative K1, the irrigated wet meadow wetlands (30 acres) in Block NW that would be impacted under the Proposed Action would not be disturbed as a function of mining because this portion of the tract would not be included in a lease sale under this alternative (see Table 4.16.2). Approximately 0.03 acre of riparian wet meadow habitat type would be impacted by the relocation of KFO Route 116 under Alternative K1.

Under Alternative K1, total disturbance to riparian areas would be 11.4 acres (see Table 4.16.2). Of this total, 3.7 acres would be disturbed from surface mining. Direct impacts from the relocation of KFO Route 116 would be from the removal of 0.3 acre of riparian area. Assuming that impacts from dispersed facilities (92 acres) are proportional to the acreage of riparian areas present in the no-coal zone (where all dispersed facilities are assumed to be located), approximately 7.4 acres of riparian area would be disturbed from the construction of these facilities. Under Alternative K1, the total disturbance to riparian areas of 11.4 acres would be 11.4 acres more disturbance than under the No Action Alternative. As under the Proposed Action, the impacts from disturbance or removal of riparian areas would depend on the quality of the existing habitat and the reclamation that followed the disturbance. Impacts would include loss of native vegetation, loss of wildlife habitat, and destabilization of the associated streambanks. Riparian areas that are supported by shallow, near-surface groundwaters could be impacted if water levels in the associated shallow groundwater systems are lowered as a result of proposed mining activities. Similarly, riparian areas that are supported by groundwater discharges from springs could be impacted if discharges from the associated springs are diminished. The potential for such occurrences would be evaluated by DOGM as part of the mine permitting process. Site-specific investigations of riparian systems and the potential for impacts to these systems based on a detailed MRP would be required as part of this process. Additionally, DOGM performs an assessment of the cumulative hydrologic impacts of coal mining for the region (CHIA), which includes an analysis of the potential for impacts to important ecosystems.

Under Alternative K1, all floodplains/terraces (57 acres) and probable AVFs (57 acres) present on the tract occur in the no-coal zone. Though this acreage would not be directly impacted from pit disturbance, direct impacts would result from construction of dispersed facilities and relocation of KFO Route 116. The nature of these impacts is the same under Alternative K1 as under the Proposed Action. The floodplains/AVFs make up approximately 9.7% of the total no-coal zone area available for dispersed facilities (581 acres). Assuming that impacts from dispersed facilities (92 acres) are proportional to the acreage of floodplains/AVFs present in the no-coal zone, approximately 9.0 acres of floodplain/AVF area would receive surface disturbance under Alternative K1 (9.0 acres more disturbance of floodplain/AVF area than under the No Action Alternative; see Table 4.16.2). Approximately 37,161 linear feet of ephemeral and intermittent drainages are within the surface mining areas of the coal zone associated with this alternative. Approximately 17,102 linear feet of intermittent and ephemeral drainages are within the underground mining area. In surface mining areas, any riparian and floodplain character would be lost for the duration of mining. Post-mining restoration of drainages and related success criteria would be determined during the DOGM permitting process in these areas. In the absence of appreciable groundwater or surface-water resources in the area, there is no significant potential for the underground mining activities to impact important overlying surface-water resources.

4.16.7 Reasonably Foreseeable Transportation Route and Coal Loadout

All action alternatives (Proposed Action, Alternative C, and Alternative K1) would incorporate the same reasonably foreseeable 110-mile transportation route between the tract and the coal loadout near Cedar City. Approximately 13.8 miles of perennial and intermittent stream would be within 100 feet of the reasonably foreseeable transportation route. Proceeding north from the tract, approximately 16,093 feet (3.05 miles) of perennial sections of the East Fork of the Virgin River, Sevier River, and Bear Creek, and crossings of Castle Creek, Asay Creek, Mammoth Creek, and Limestone Creek (as they enter the Sevier River) are within 100 feet of the route. Approximately 56,273 feet (10.7 miles) of intermittent drainages also occur within 100 feet of the route. No surface-water features occur within 100 feet of the reasonably foreseeable coal loadout. The route would cross known stream drainages (perennial and intermittent) 118 times (see Table 4.16.2).

Adverse effects common to all action alternatives include potential effects to surface water from the accidental spills of hazardous materials along the coal haul transportation route. The severity of this occurrence would be minimized due to the required implementation of spill prevention, control, and countermeasure plan regulations associated with the transportation and storage of bulk oil products (see the Hazardous Materials section of this chapter). Use of best available control measures to minimize and/or eliminate fugitive coal dust along the transportation route and at the loadout would be installed on all coal haul vehicles and at the facility.

4.16.8 Potential Mitigation Measures

The following measures could be applied to all action alternatives, in addition to required measures, to further reduce or eliminate impacts to water resources identified in the analysis above:

- Water detention ponds (rather than retention) could be used to decrease the amount of water lost to evaporation following its interception and collection.
- Temporarily (life of mine) relocated segments of Robinson Creek could be planted with native vegetation to shade the creek (reducing thermal pollution) and stabilize its banks (reducing sediment pollution).
- Any flow in Robinson Creek could be diverted around the construction area to reduce sediment discharges during construction; construction could take place during a period of zero or low flow.
- Temporarily (life of mine) relocated segments of Robinson Creek could be properly designed to function as a stable, functional channel with 1) a floodplain connected to the stream; 2) the proper width, velocity, and gradient to replace all lost habitat; and 3) the proper form to convey sediment without eroding or aggrading.
- Temporarily (for life of mine) relocated segments of Robinson Creek may avoid capturing groundwater, which could increase the concentration of TDS in the creek. However, the bed and banks could be constructed to avoid use of or contact with the Tropic Shale.
- Construction of dispersed facilities in wetlands, riparian areas, and floodplains/AVFs would be avoided to the maximum extent possible.

4.16.9 Unavoidable Adverse Impacts

The Proposed Action, Alternative C, and Alternative K1 would result in unavoidable adverse impacts to water resources even following implementation of protective measures and following the above potential mitigation measures. Approximately 0.49 mile of Robinson Creek would be unavoidably relocated under the action alternatives, including the removal of its streamside and riparian vegetation. Surface water on the tract would be lost due to evaporation from ponds and infiltration. Loss of surface-water volume would reduce downstream dilution, and could therefore alter water quality. Some sediment runoff from dispersed facilities and road relocation ROWs would be unavoidable because BMPs are less than 100% effective. The risk of spills or water contamination would be small, but would be unavoidably increased under the action alternatives. Groundwater would also be consumed (depleted) under the action alternatives. Approximately 25 acre-feet per year of groundwater would be lost due to evaporation from pits and dust suppression. The loss of wetland acreage and function on the tract could not be avoided.

4.16.10 Short-term Uses versus Long-term Productivity

No impacts to the long-term productivity of water quantity are expected as a result of the short-term use of the land for coal extraction. Once mining ceases and reclamation is complete, mine-related water use and increased evaporation would cease. The short-term use of the land for coal extraction would result in long-term alteration of wetland and riparian area functions and productivity. Similarly, the short-term use of areas occupied by Robinson Creek would result in the long-term alteration of Robinson Creek.

4.16.11 Irreversible and Irretrievable Commitments of Resources

The following commitments of water resources would be irretrievable until successful reclamation was completed under the action alternatives:

- Loss of Robinson Creek’s channel function and riparian vegetation
- Changes to Robinson Creek’s discharge volume and water quality resulting from its realignment
- Loss of wetland area and function due to its removal and reconstruction
- Loss of riparian area and function due to its removal along Robinson Creek
- Surface disturbance to floodplains and probable AVFs as a result of the construction of dispersed facilities and relocation of KFO Route 116

4.17 Wildlife: General

This section assesses the environmental consequences of Alternative A (No Action), Alternative B (Proposed Action), Alternative C, and Alternative K1 on wildlife, raptors, and migratory birds with potential to occur on the proposed Alton Coal Tract and the reasonably foreseeable coal haul transportation route. Impacts to wildlife would be avoided to some degree through lease stipulations, and conservation and/or mitigation measures. However, both direct and indirect impacts to wildlife are expected to result from minerals development and construction activities in the tract, as proposed under the action alternatives, and from traffic changes on the reasonably foreseeable coal haul transportation route, both of which could affect individuals, populations, or habitat conditions.

4.17.1 Regulatory Framework and Lease Stipulations

4.17.1.1 REGULATORY FRAMEWORK

Numerous federal and state regulations shape the management of wildlife species. Regulations that pertain to wildlife and potential impacts from mining and other land uses include the following:

- The MBTA of 1929, as amended, establishes federal responsibility to protect international migratory birds and authorizes the Secretary of the Interior, through the USFWS, to regulate hunting of migratory birds. The North American Waterfowl Management Plan, signed in 1986 between Canada and the United States, further sets population goals and how to achieve them.
- The Taylor Grazing Act of 1934, as amended, requires cooperation with states and other groups interested in conservation and propagation of wildlife in established grazing districts. It provides for fishing and hunting in those districts in accordance with applicable laws.
- The Fish and Wildlife Coordination Act of 1958 mandates equal consideration of wildlife conservation with other features of water resource development programs. It requires that damage to fish and wildlife resources be prevented and that these resources be developed and improved.
- The CAA establishes the mechanism for control of air pollution for public health and welfare, recognizing wildlife as one aspect of public welfare.
- The FLPMA recognizes wildlife as a principal land use, requires consideration of wildlife objectives in commodity-oriented programs, and authorizes use of range-betterment funds for enhancement of habitat for fish and wildlife.
- The objective of the Federal Water Pollution Control Act of 1977 is the restoration and maintenance of the chemical, biological, and physical integrity of the nation’s waters at a quality sufficient to protect fish and wildlife and sufficient for recreational use.
- The Public Rangelands Improvement Act of 1978 directs that the condition of the public rangelands be improved so that they become as productive as feasible for wildlife habitat and other rangeland values. The act provides for on-the-ground funding of wildlife habitat protection, improvements, and maintenance projects.
- The North American Wetlands Conservation Act of 1989 is the first act to make federal funds available annually for wetland restoration in the United States, Canada, and Mexico. The act is intended to generate as much as $30 million a year toward the North American Waterfowl Management Plan.
- EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds directs executive departments and federal agencies to take certain actions to implement the MBTA.
- The DOI BLM and USFWS MOU (2010) to promote the conservation of migratory birds outlines a collaborative approach pursuant to EO 13186.

Other federal laws that could occasionally affect wildlife habitat management actions in the tract are those listed under Section 4.18.1.1.1, the MLA, the Water Resources Planning Act, the Water Pollution Act, the Water Resources Development Act, the Federal Grants and Cooperative Agreements Act, the Safe Drinking Water Act, the Fish and Wildlife Act, and the Soils and Water Resources Conservation Act.

4.17.1.2 DESIGN FEATURES

The KFO RMP and other BLM and state documents provide the framework for the tract's design features, which would be reflected in lease stipulations as part of a lease contract after a ROD. DOGM, a state agency under Utah's Department of Natural Resources (UDNR), would be responsible for ensuring compliance and enforcement of the lease stipulations. The following design features would be applicable to wildlife and would compel mitigation for impacts to wildlife related to mining the tract:

- Conduct baseline and annual wildlife monitoring surveys. If a decrease or negative effect resulting from mining activities is shown, appropriate species-specific mitigation measures would be developed at the permitting stage.
- During mining operations, follow approved raptor mitigation plans such as USFWS's *Utah Field Office Guidelines for Raptor Protection from Human and Land-use Disturbances* (Romin et al. 2002).
- Monitor for BCCs. Exact mitigation measures would be developed at the permitting stage.
- At permitting, develop a migratory bird and raptor conservation plan that outlines avoidance and minimization mitigation measures for impacts to migratory birds, raptors, and their habitat.
- After mining is completed, restore pre-mining topography to the maximum practical and economic extent possible.
- For site restoration, plant a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife.
- During all operations, design fences to permit wildlife passage.
- Increase habitat diversity by creating rock clusters and shallow depressions on reclaimed land.
- Use appropriate plantings along reclaimed drainages, such as native species as well as species that provide forage for big game (some of which may not be native).
- After mining operations are completed, replace drainages, wetlands, and AVFs disturbed by mining.
- During all operations, operate vehicles at appropriate speed limits to minimize potential for wildlife mortality.
- During all operations, instruct employees not to harass or disturb wildlife.
- Conduct biannual post-reclamation surveys for undesirable invasive plant species.
- Begin vegetation monitoring during the next growing season following fall seeding and planting and monitor biannually to assess reclamation success until goals are achieved.
- Monitor reclamation sites to assess habitat reclamation success.
- Develop a practical and economic blasting plan that is sensitive to noise impacts on wildlife, especially during nesting and breeding seasons.

These design features would help reduce the severity of impacts to wildlife by enhancing and restoring native and suitable non-native vegetation communities in the short term and long term and by defining actions aimed at avoidance and minimization.

4.17.2 Impact Indicators and Thresholds

In this analysis, acres of surface disturbance in or adjacent to wildlife habitats are used as the primary indicator of impacts in the tract. Potential impacts to wildlife, such as changes in habitat quality or quantity, reduced population size, or increased mortality, are also used as impact indicators. Surface disturbance from minerals development and construction activities would occur in the tract as planned under the action alternatives. Impacts to wildlife species associated with riparian habitats adjacent to the reasonably foreseeable coal haul transportation route are analyzed as acres within a 100-foot buffer on both sides of the route. Impacts to all other wildlife species and their habitats on the reasonably foreseeable coal haul transportation route are analyzed using miles of habitat adjacent to the route. Impacts to wildlife on the reasonably foreseeable coal haul transportation route are analyzed separately from impacts associated with the tract (see Section 4.17.5). The coal haul transportation route that is used for analysis purposes is the most reasonably foreseeable route, but it is impossible to predict the exact route that a successful bidder might choose. For noise analysis, dBA above ambient noise conditions were used as an additional indicator of impacts. For nighttime lighting analysis, lumens—a measurement of the brightness of light as perceived by the human eye—were used. Because organisms perceive light differently, it is difficult to predict how different magnitudes of lumens will affect different species. Research by the International Dark-Sky Association (IDA) suggests that blue-rich white light is more detrimental to most wildlife than amber or redder light (IDA 2010). It can also be assumed that more nighttime light is more detrimental to nocturnal wildlife. For this analysis, it is assumed that the level of impacts would be proportional to the magnitude of lighting output, with impacts increasing as the magnitude of the lighting increases.

As indicated in Section 3.17, wildlife habitat acreages are based on detailed vegetation community surveys in the tract (SWCA 2007a), and on southwest regional land cover data (SWReGAP 2004) along the reasonably foreseeable coal haul transportation route (see Section 3.15 for a detailed description of the vegetation communities present in the tract). The vegetation communities (also referred to as habitat types) discussed for the tract and the reasonably foreseeable coal haul transportation route differ because of differences between the field surveys and SWReGAP datasets, and because different land cover types occur in these areas. Because impacts to the tract and the reasonably foreseeable coal haul transportation route are analyzed separately, land cover types are not directly compared, and differences in cover types are not a limiting factor in the analysis.

Three general categories of habitat impacts are anticipated to be the most influential on wildlife and their habitats: 1) habitat fragmentation and alteration, 2) habitat loss and displacement of both individuals and populations, and 3) habitat improvement. Habitat fragmentation occurs when a contiguous habitat is broken up or fragmented by surface-disturbing activities causing a reduction in usable ranges and a disruption of movement among habitat areas. In addition, habitat fragmentation causes the isolation of less mobile species, a decline in habitat specialists, and facilitates invasion by generalist species (Marvier et al. 2004). Habitat alteration occurs when surface-disturbing activities directly or indirectly change the composition, structure, or functioning of the habitat. Habitat loss is caused by surface-disturbing activities or other activities that degrade or remove habitat. Displacement occurs when land use activities force wildlife to move into other habitats, thereby increasing stress on individual animals and increasing competition for habitat resources. Any surface-disturbing actions could lead to habitat alteration, fragmentation, loss, or wildlife displacement; limit the amount of usable habitat for wildlife; and restrict movement among habitat areas. Habitat improvement results from maintenance, reclamation, revegetation, vegetation treatments, or other management actions that increase the quantity and/or quality of habitat conditions, or is otherwise beneficial to one or more wildlife species. Improvements would mostly take place with the goal of reducing juniper encroachment of sagebrush habitat. Additional categories of impacts to wildlife include 1) loss of individuals, and 2) loss of populations.

4.17.3 Analysis Assumptions

The locations and habitats of some species in the tract and the reasonably foreseeable coal haul transportation route are known; however, the data are neither complete nor comprehensive for all wildlife species occurrences or for all potential habitats that might exist. Both known and potential species and habitat locations are considered in the analysis. The species and potential habitats that could be affected by various actions are assumed to be directly correlated with the degree, nature, and quantity of surface disturbance and other activities. Impacts are quantified wherever possible. In the absence of quantitative data, best professional judgment is used to analyze impacts. This analysis was prepared using the following assumptions:

- Local populations are naturally affected by nonhuman causal factors, such as climate, natural predation, disease, natural fire regimes, and competition with other native species for available habitat.
- Impacts to wildlife and special status species depend on the location, extent, timing, and intensity of the disturbance.
- Impacts to wildlife species with a limited distribution of individuals and habitats and/or a low tolerance for disturbance are likely greater than impacts to common and/or tolerant species.
- Ground-disturbing activities could lead to the fragmentation, alteration (positive or negative), loss, or displacement (short term or long term) of wildlife habitats and/or loss or gain of individuals or populations.
- Disturbance occurring adjacent to wildlife habitat would contribute to habitat fragmentation, alteration, and displacement due to reduced habitat quality or accessibility.
- Changes in air, water, and habitat quality may cause direct and indirect impacts to wildlife and habitats, and may also have cumulative impacts on species survival.
- The existing ambient noise condition on the tract is approximately 40 dB. Wildlife species would be negatively impacted by increasing ambient noise.
- Increased ambient nighttime light (measured in lumens) results in corresponding negative impacts to wildlife.
- Blue-rich lighting is more detrimental to most wildlife.
- Increased ambient nighttime light is more detrimental to nocturnal wildlife.
- If mitigation, habitat maintenance, or habitat improvement actions are demonstrated to be successful, these actions could maintain or improve the condition of vegetation, soils, and other habitat conditions. This would be accomplished through vegetation treatment projects, restrictions on surface-disturbing activities, and site reclamation and restoration.

Impacts to stream and riparian habitats associated with the reasonably foreseeable coal haul transportation route are based on the assumption that the likelihood of a coal spill along the route would be proportional to the occurrence of one accident per year anywhere along the entire reasonably foreseeable route. It is not possible to predict future conditions that could contribute to an accident; nevertheless, the chance of an accident occurring near stream or riparian habitats, which make up a very small portion of the route, would be extremely low.

In addition to conservation and lease notices, the following would apply: species-specific recovery plans and conservation documents that include management plans and strategies to protect wildlife. Applicable documents to the tract and the reasonably foreseeable coal haul transportation route include the *Monitoring Plan for the American Peregrine Falcon* (USFWS 2003), *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin et al. 2002), and *Best Management Practices for Raptors and Their Associated Habitats* (BLM 2008a:Appendix 2). In addition, most native bird species are protected under the MBTA of 1918, which prohibits direct take and destruction of occupied nests, whereby clearing of vegetation during the breeding season could result in loss of eggs or young and would be a violation of the act.

The following analysis assumes (as per the description of the Proposed Action [Section 2.3]) that mining would occur on approximately 120 acres at any one time, with an additional approximately 120 acres or more in some stage of reclamation. Centralized facilities would be located on approximately 36 acres, the exact location of which would move depending on the location of the mining. This process would take place for approximately 25 years, with the exact areas undergoing mining and reclamation changing annually. Impacts are analyzed below based on the concept that 120 acres of active mining could occur at any location throughout the tract, except for those locations prohibited in the lease conditions, and would eventually have occurred at all coal-bearing locations in the tract. Also, this analysis assumes that reclamation would take place on a rolling basis with mining, and that reclamation actions would conform to the standards listed in the lease stipulations and would be successful.

4.17.4 Impacts as a Result of Mining the Tract

4.17.4.1 ALTERNATIVE A: NO ACTION

Under the No Action Alternative, the tract would not be mined, and no coal mining or related activities, infrastructure development, or relocation of KFO Route 116 would occur. Therefore, no acres of wildlife habitat would be disturbed by these activities. However, management under the No Action Alternative would not restrict permitted mining activities on private lands adjacent to the tract. Mine-related activities would occur to a lesser degree than under the Proposed Action, Alternative C, or Alternative K1 because the total acreage of mining activities and the total duration of mining activities would be considerably less than under either of these alternatives.

Management of wildlife habitats on BLM-administered lands in the tract would be conducted as directed under the KFO RMP (BLM 2008b). Under the No Action Alternative, prescribed management on BLM-administered lands would include watershed protections and improvements to wildlife habitats. Vegetation treatment projects to restore sagebrush grasslands that have been invaded by pinyon-juniper woodlands would improve ecosystem functioning and watershed health. Vegetation management would have long-term beneficial effects for upland animal species by removing undesirable vegetation, increasing species and structural diversity, and improving overall habitat quality. Pinyon-juniper tree removal would reduce the amount of foraging, roosting, and nesting habitats available to raptors, bats, and migratory birds. Some vegetation treatments would help reduce soil loss and improve water quality and therefore would likely improve aquatic and riparian habitats and benefit the wildlife species that rely directly or indirectly on these habitats. Erosion control measures would reduce sedimentation of water sources and associated impacts to amphibian species. Vegetation and soil treatments would help to reestablish upland communities, maintain or improve the health of riparian/wetland communities, reestablish seedlings and understory vegetation, and retain soil moisture and nutrients (BLM 2008a).

Table 4.17.1 lists the vegetation communities present in the tract, the wildlife species associated with each community, and the acres of disturbance that would occur to each community under the No Action Alternative, Proposed Action, Alternative C, and Alternative K1.

Table 4.17.1. Acreages and Direct Disturbance in the Alton Coal Tract by Vegetation Community and Associated Wildlife Under the No Action and Action Alternatives

Vegetation Community	Associated Wildlife and Special Status Species[8]	Alternative A (No Action)	Alternative B (Proposed Action)			Alternative C (Reduced Tract Acreage and Seasonal Restrictions)			Alternative K1 (Reduced Tract Acreage)		
		Direct Acres Disturbed	Acres in Tract	Direct Acres Disturbed	Percentage Disturbed	Acres in Tract	Direct Acres Disturbed	Percentage Disturbed	Acres in Tract	Direct Acres Disturbed	Percentage Disturbed
Pinyon-juniper woodland	Elk, Sharp-shinned Hawk, Cooper's Hawk, Black-throated Gray Warbler, Gray Vireo, Loggerhead Shrike, Virginia's Warbler, Black-capped Chickadee, Townsend's solitaire, Pinyon Jay, Red-naped Sapsucker	0.0	1,430.8	694.4	48.6%	1,409.7	680.1	48.2%	1,095.1	471.6	43.1%
Sagebrush/ grassland	Elk, mule deer, Brewer's Sparrow, Sage Sparrow, Mountain Bluebird, Green-tailed Towhee, Sage Thrasher	0.0	860.2	366.5	42.6%	627.8	195.7	31.2%	369.1	91.2	24.7%
Sagebrush/ grassland (treated)	Elk, mule deer, Brewer's Sparrow, Sage Sparrow, Mountain Bluebird, Green-tailed Towhee, Sage Thrasher	0.0	749.1	547.5	73.1%	749.1	546.0	72.9%	289.5	235.9	81.5%
Annual and perennial grasses	Elk, mule deer, Peregrine Falcon, Prairie Falcon, Swainson's Hawk, Rough-legged Hawk (winter), Mountain Bluebird, Bendire's Thrasher	0.0	324.1	278.4	85.9%	247.0	196.5	79.6%	247.0	196.8	79.7%
Mountain brush	Elk, Black-throated Gray Warbler, Gray Vireo, Virginia's Warbler, Spotted Towhee, Gambel's Quail, Black-chinned Sparrow	0.0	62.8	24.9	39.6%	62.8	24.7	39.3%	40.8	1.7	4.2%
Wetland (meadow)	Elk, mule deer, Lesser Goldfinch, Red-winged Blackbird	0.0	62.8	55.5	88.3%	0.0	0.0	0%	0.0	0.0	0%
Riparian	Elk, Northern Harrier, Red-tailed Hawk, Great-horned Owl, Western Screech-Owl, Downy Woodpecker, American Dipper, Yellow-breasted Chat, Yellow Warbler	0.0	55.3	6.7	12.1%	54.0	6.3	11.7%	54.0	6.4	11.9%
Rabbitbrush	Elk, Gambel's Quail, Brewer's Sparrow, Sage Sparrow, Mountain Bluebird, Green-tailed Towhee, Sage Thrasher	0.0	10.7	1.0	9.2%	10.7	1.0	8.0%	10.7	1.0	9.3%
Bedrock, cliff, and canyon	Peregrine Falcon, Prairie Falcon, Rock Wren	0.0	0.0	0.0	0%	0.0	0.0	0%	0.0	0.0	0%
Open water	Mallard, shorebirds, amphibians	0.0	4.1	0.0	0%	0.0	0.0	0%	0.0	0.0	0%
Habitat total		**0**	**3,559.9**	**1,974.8**	**55.5%**	**3,161.6**	**1,650.3**	**52.2%**	**2,106.2**	**1,004.6**	**47.7%**

[8] Scientific names for all wildlife can be found in Chapter 3.

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4.17.4.2 IMPACTS COMMON TO THE ACTION ALTERNATIVES

4.17.4.2.1 Habitat Loss

Under the Proposed Action, Alternative C, and Alternative K1, there would be a short-term loss of all vegetation communities from the clearing of vegetation during the life of the mine and from the construction of centralized and dispersed facilities. Vegetation and soil would be removed from active mining areas (120 acres annually) and stockpiled, with reclamation and revegetation taking place concurrently on previously mined parcels. Long-term fragmentation, alteration, loss, or displacement of wildlife habitats would occur during mining and restoration activities, because some or all reclaimed habitats would not have developed to a mature, structurally, and compositionally diverse condition. Mountain big sagebrush takes approximately 30 years to reestablish following a fire (Ziegenhagen 2003); however, in the BLM's experience with vegetation treatments completed locally, the successional development of a mature sagebrush community in the tract would take approximately 20 years. Because restoration plans include planting sagebrush seedlings instead of seeds, the recovery period for sagebrush would be further reduced to some degree. For the purpose of this document, it is assumed that successional development of a mature sagebrush community would require approximately 20 years, depending on site conditions. During this recovery period, restored sites may have lower habitat quality than fully developed vegetation communities, and would therefore be of less value to most wildlife species, particularly those that require mature sagebrush habitats.

On federal lands, reclamation would involve the reestablishment of native and suitable non-native vegetation communities to resemble sagebrush steppe. On private lands, revegetation would involve the reestablishment of pre-mining agricultural vegetation. Impacts would be partially mitigated by revegetation and habitat treatment plans. There would be displacement of wildlife and interference with movement patterns from areas of active mining and construction. Injury or potential for mortality of smaller and less mobile animals (e.g., rodents, reptiles, and amphibians) could result from individuals being crushed on the ground or in burrows, buried in spoil areas, or trapped in excavated areas and buried. Small animals, such as amphibians, lizards, and small mammals, in mined and developed areas would likely be displaced, injured, or have potential for mortality.

4.17.4.2.2 Avian Breeding Disturbance

Disruption of breeding or loss of nests or young could take place if mining and construction occurs during the nesting season for raptors and other birds. Disruption of breeding would not be avoided, and some individuals could be lost or not return to the area to breed due to ongoing mining activities. These impacts would be decreased by restricting clearing of vegetation to nonbreeding seasons, or by conducting nest surveys and protecting individual nests during breeding periods. Of the habitats in the tract, pinyon-juniper woodlands would likely have the highest diversity of breeding migratory birds, and would be similarly affected under all action alternatives. Riparian and cliff and canyon habitats would have the highest densities of raptor nesting habitats, and would also be similarly affected under all action alternatives. Disturbance to native habitats could also cause degradation of wildlife habitats due to an increased risk of noxious weeds invasion and associated alteration of habitat composition and structure. The level of mining proposed in the Proposed Action may affect individuals, but would not affect populations of migratory birds or raptors.

4.17.4.2.3 Water Loss and Creek Relocation

Under the action alternatives, approximately 8.12 million gallons (25 acre-feet) of water per year would be used for dust suppression and equipment washing. Modifications to Robinson Creek and Kanab Creek in the tract would have negligible impacts on potential habitats for amphibian species due to limited surface water. The relocation of Robinson Creek would reduce or eliminate any existing flows and connectivity, remove structural habitat features, reduce or eliminate avian and amphibian prey species (i.e., invertebrates), and increase erosion and sedimentation of connected surface waters. Relocation of existing streams would require surface impacts during dredging of a new stream channel and filling of the existing channel, as well as surface disturbance from construction equipment. Wildlife that relies on aquatic and riparian habitats would be displaced from both the original creek bed and replacement creek bed until restoration is completed. Impacts from stream crossing developments on Kanab Creek would be minimal due to limited surface-water flows and associated amphibian habitats.

4.17.4.2.4 Road Relocation and Transportation

Under the action alternatives, portions of KFO Route 116 in the tract would be relocated to allow for mine-related disturbance within 100 feet of the road. KFO Route 116 would be sited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible. Where it is not possible to avoid disturbances to these areas, site-specific mitigation measures would be prescribed at the permitting stage, when more details are known about the mining sequence. Relocation of KFO Route 116 would be temporary, and the road would be reestablished in the approximate, original roadbed following mining. Two-track roads on private and BLM-administered lands in the tract would be closed during mining operations and replaced following completion of mining and reclamation activities. Temporary two-track roads may be constructed and reclaimed following mining. Surface disturbance from road relocation would impact wildlife by removing and fragmenting existing habitats, and by reducing habitat quality in adjacent habitats due to noise and disturbance associated with road construction and use.

There would be an increased likelihood of mortality of individuals from collisions with mine-related vehicles on KFO Route 116. Approximately 153 truck round-trips per day and worker and service traffic to and from the tract would occur for the duration of the mining operation. Impacts to wildlife from coal truck and other vehicle traffic in the tract would vary according to the size, mobility, and movements of each species. Wildlife groups most susceptible to vehicle-related mortality include groups that are attracted to road habitat (such as reptiles), groups with high mobility (such as big game and cougar), and habitat generalists (such as many species of small mammal) (Foreman et al. 2003). Vehicle-related mortality of raptors and other bird species could also occur from birds scavenging roadkill, and would be proportional to the amount of roadkill that occurs. Scavenging of roadkill would primarily be expected along the paved highways of the proposed haul route, such as US-89 and SR-20.

Roads can also effectively act as a movement barrier to some wildlife species, especially when the road is wide and handles high amounts of traffic, as would occur on the KFO Route 116. Species that are most susceptible to barrier effects are those that tend to avoid roads and also require large tracts of habitat for survival (Forman et al. 2003), such as bobcat, mountain lion, and elk. Other wildlife groups vulnerable to these effects include small mammal and amphibian species. Because of the presence of roads and barrier effects (which reduce landscape connectivity), these species are more susceptible to reduced gene flow and a reduced regional population size. Many wildlife species are therefore at a greater risk of a reduction in the regional population size due to the presence of roads and increased traffic on existing roads.

The mining and haul truck activity on the tract and road, as well as the associated habitat removal, would lead to habitat fragmentation, especially for highly mobile species that occupy large habitat patches, such as big game species. This fragmentation could augment typical wildlife movement patterns, such as seasonal migration and daily use.

Under the Proposed Action, both water and MgCl may be sprayed on haul roads and exposed soils as dust suppressants (see Table 2.6.1). Although MgCl is less harmful to biological systems than many other dust suppressants, it still impacts wildlife (Forman et al. 1998). These impacts are especially harmful in aquatic systems because the chemical moves easily with water through soils (Piechota et al. 2002). Amphibians and other aquatic species may be killed or have negative physical effects from direct ingestion, and are also sensitive to increased salinity in water systems (Piechota et al. 2004). In terrestrial systems, MgCl has been associated with the browning of trees along roadways and stunted vegetation growth in forest lands (Piechota et al. 2004). This browning and/or stunting would reduce available forage for wildlife species, such as deer, elk, and other herbivores, ultimately reducing the health of the individual by reducing food availability and disrupting normal habitat use patterns. However, these impacts would be limited to vegetation directly adjacent to haul roads and exposed soils, which would be areas of human activity that wildlife would likely avoid in the first place.

4.17.4.2.5 Noise and Lighting Impacts

Under the action alternatives, mining activities would be ongoing 24 hours a day, seven days a week. Noise and ground vibration would occur from blasting, the use of electrical power generators, and coal processing, loading, and transport from centralized facilities. A blasting plan that limits disturbance to wildlife would be completed if the tract is leased and after a successful bidder is chosen. Noise can impact wildlife in several ways, as follows (Lynch et al. 2011):

- Noise can interfere with acoustical awareness by temporarily deafening animals, especially those close to the source, with very loud sounds or by distracting animals with less dramatic noises. Distraction can be especially detrimental if the typical predation or foraging pattern of the animal is altered, such as the coyote being unable to catch a prey item. Repeated distractions can lead to a reduction in individual health and ultimately in the health and success of the population.
- Noise can add to existing sound levels and reduce the range at which signals can be detected, identified, and localized (masking). Masking can increase predation rates for colonial species, such as prairie dogs and ground squirrels, if warnings indicating the presence of a predator are not heard by other individuals.
- Prolonged exposure to noise has been shown to cause some wildlife, such as mule deer and songbirds, to avoid certain areas, reducing already limited potential habitat. Displacement due to noise has also been shown to impact songbirds by reducing pairing success, bird density, and biodiversity of birds in the area.

The ambient noise levels of 40 dBA would be increased by use of heavy equipment, diesel generators, coal haul trucks, equipment related to the centralized facility, and blasting events. A description of the noise levels produced from mining operations by alternative can be found in Section 4.2.2 (Soundscape). The severity of impacts would be greatest near the noise sources, such as the mining and centralized facility locations. Noise levels could range from as low as 48 dBA to over 80 dBA within approximately 1 km of the mining activities. Noise impacts from mining the tract would occur at levels as high as 56 dBA from 1 to 5 km away from mining activities. These impacts would decrease the further one is from the mining activities, with impacts to ambient noise levels from mining ending at distances greater than 5 km from the mining activities. Due to these noise impacts, wildlife could be displaced from an area centered around the mining activity for up to 5 km. Additionally, periodic noise and vibrations from blasting activities would add from 90 to 186 dBA to ambient noise levels, depending on the distance from the blast. These activities would disrupt normal wildlife behavior for brief periods, with a return to normal activity when noise levels return to ambient.

Although noise levels from mining activities would be the same under all action alternatives, the locations and duration of the noise from the mining activities would vary. Mining would not take place in Block NW under Alternative C and mining would not take place in Blocks NW or S under Alternative K1. Thus, wildlife near Blocks NW and S would be less affected by noise impacts under those alternatives. Mine life varies among all of the alternatives as well, with mining lasting 25 years under the Proposed Action, 21 years under Alternative C, and 16 years under Alternative K1. Thus, the duration of noise impacts from mining activities would also vary among the action alternatives.

Under all action alternatives, artificial lighting would be used throughout the night, increasing skyglow. Three types of artificial lighting sources are proposed for use during nighttime operations: 1) portable lighting towers for use at the mine pit during active nighttime mining; 2) fixed light towers to be used for lighting centralized mine facilities; and 3) mobile light sources generated by vehicles, mining equipment, and flashlights. These lighting sources are described in more detail in Section 4.2.4 (Nighttime Lighting and the Extent of Skyglow). Illumination is most often measured in lumens, which expresses the brightness of light as perceived by the human eye. Because organisms perceive light differently, it is difficult to predict how different magnitudes of lumens would affect different species. Research suggests that blue-rich white light is more detrimental to most wildlife than amber or redder light (IDA 2010). However, lighting with the blue-green spectrum would be needed in areas where color rendition is required for safety purposes, as required by MSHA regulations. It can also be assumed that more nighttime light is more detrimental to nocturnal wildlife. For this analysis, it is assumed that the level of impacts would be proportional to the magnitude of lighting output, with impacts increasing as the magnitude of the lighting increases.

Disturbance to or displacement of wildlife would likely occur from an area an unknown distance around the lighting during nighttime operations. Artificial night lighting affects animal foraging behavior, reproduction, movement, and species interactions (such as predator-prey, pollinator-plant, and competition relationships) (Beier 2006; Longcore et al. 2005; Miller 2006). Nocturnal mammals respond to increased nighttime light by reducing or shifting their periods of activity, traveling shorter distances, and consuming less food (Longcore et al. 2005). Diurnal (day-active) and nocturnal wildlife could be displaced from, or attracted to, habitats affected by night lighting, depending on the species. However, night lighting increases the risk of predation for small, nocturnal mammals and decreases food consumption when animals, such as deer and elk, reduce foraging activities to remain concealed in an artificially lit environment (Beier 2005). Night lighting may also increase the risk of animal mortality from vehicle collisions (Longcore et al. 2005).

4.17.4.2.6 Subsidence Impacts

Subsidence from underground mining operations and from the removal of coal would be expected to cause surface cracks, lower the ground surface, and cause the fracture or failure of cliffs (personal communication, J. Smith). Several small areas of the bedrock, cliff, and canyon habitat vegetation community are adjacent and east of the tract, but none occur on or adjacent to the northeast corner of the tract (Block C) where underground mining would be expected to occur. Subsidence would be expected to occur within one year of mining operations and would permanently impact the topography, physiography, and stratigraphy of the area. If subsidence occurs, direct or indirect impacts to wildlife and their habitats would occur from collapse of surface topography, such as rock walls or cliffs, resulting in a potential loss of nesting or roosting habitat.

4.17.4.2.7 Reclamation and Vegetation Treatments

The KFO RMP (BLM 2008b) includes habitat maintenance, vegetation treatment, and species-specific management stipulations. A detailed, site-specific MRP would be applied for reclamation and reestablishment of vegetation, with planned mitigation required before coal mining and coal mine–related activities could occur. Nevertheless, wildlife habitats would be fragmented, altered, or lost in the short term from surface disturbance from coal mining and construction and from associated impacts such as increased susceptibility of disturbed sites to weed invasion, reduced species diversity, and altered habitat structure.

Herbicides would be used to prevent the spread of invasive weeds on the tract. Potential impacts to wildlife from the use of weed treatment herbicides include the following: mortality from toxicity (Shepard et al. 2004); disruption of the development of vital systems such as the endocrine, reproductive, and immune systems (Colborn et al. 1993); and reduction in insect abundance as a source of food for avian species (Taylor et al. 2006). These impacts are most likely to occur in small-bodied animals, such as small mammals, birds, amphibians, and some reptiles. However, according to Tatum (Tatum 2004), the most commonly used herbicides in vegetation management, when used according to label instructions, pose little risk to wildlife. If the tract is leased, the successful bidder would be required to use the commonly used herbicides that pose little risk to wildlife, thereby minimizing potential impacts on wildlife.

Over the long term (longer than the life of the mine), mining reclamation and sagebrush restoration activities are expected to improve crucial big game habitats, restore ecological functioning, and increase forage production of some areas within the tract that are degraded prior to the commencement of mining. In these areas, habitat reclamation and revegetation actions would enhance habitat for wildlife that use sagebrush habitats, such as those listed in Table 3.17.2. The magnitude of beneficial impacts to each species would be related to how dependent the species is on sagebrush habitats as well as how easily each species adapts to habitat changes. Reestablishment of vegetation would serve to mitigate the short-term negative impacts of surface disturbance on vegetation communities by restoring native and desirable non-native species. Immediate site reclamation and restoration of the native vegetation community would reduce the duration of habitat loss and the impacts to wildlife from habitat fragmentation and loss. Habitat restoration actions would be expected to enhance habitat quality in these areas over the long term by restoring native and desirable non-native species to create structurally and compositionally diverse vegetation communities. There would also be a period of habitat loss that would have minor to substantial impacts to wildlife depending on their reliance on the lost habitat.

The regulatory framework and required mitigation measures are described under the action alternatives and in Section 4.17.1.

4.17.4.2.8 Summary of Impacts Common to all Action Alternatives

Direct adverse effects under the action alternatives would include

- direct mortality of individuals due to crushing or burial during mining operations from the operation of mining equipment and vehicles, as well as the removal and storage of dirt and materials from the mining pits;
- alteration or loss of suitable and/or potential habitats due to surface disturbance, noise, ground vibration, or night lighting;
- disruption of breeding, nesting, or roosting activities due to surface disturbance, human presence, increased levels or duration of noise, and night lighting during 24-hour operations;
- disruption of bird migration and habitat use due to mining and associated disturbance and human presence;
- alteration of hydrologic or geologic conditions in or adjacent to the tract due to surface disturbance or subsidence during underground mining; and
- mortality, stress, or effective loss of habitat due to increased vehicle and coal truck traffic.

Indirect adverse impacts would include

- habitat fragmentation and subsequent displacement of individuals or populations due to surface disturbance and development;
- dust and dust-suppressant (MgCl) impacts to habitat quality from increased travel and construction activities during the life of mining operations;
- increased susceptibility of disturbed areas to weed invasion and associated alteration of vegetation communities and habitat structure from surface disturbance;

- potential mortality, disruption of vital systems, or decrease in insect abundance as an avian food source as a result of herbicide use;
- increased mosquito-borne disease transmission to special status species populations due to the presence of standing water in holding ponds or excavated areas;
- increased ambient noise from mining equipment (including coal trucks) and centralized facilities; and
- increased nighttime lighting from centralized facilities, portable facilities, and mobile light sources.

The additive impact of all of these effects combined would likely result in most wildlife species, including big game, migratory birds, and raptors, being displaced from the area of active mining as well as from an unknown buffer distance around the active mining activity (because of increased noise and lighting). Less mobile animals, such as some reptiles and small mammals, would likely be crushed or otherwise killed on-site. After areas are mined and reclaimed, wildlife would likely return to the habitat in the long term; however, successful reclamation may take a prolonged amount of time, and some wildlife species may not return for an extended period. Wildlife that exhibit fidelity to certain exact locations would be the most dramatically impacted, such as nesting raptors, because they often return to previously used nest locations. It is likely that raptor nests and nesting locations would be destroyed or otherwise altered by mining activities, resulting in reduced breeding success and reduced health of the individual and/or population. Typical use and movement patterns of other mobile species would likely be impacted, and local populations of some of these species may experience reduced health.

4.17.4.3 ALTERNATIVE B: PROPOSED ACTION

Under the Proposed Action, the tract would encompass approximately 3,576 acres. Approximately 1,993 acres of surface disturbance from surface mining and infrastructure development would occur in the tract over approximately 25 years. At any one time there would be a single open pit (approximately 120 acres) and an additional 120 acres or more in some stage of reclamation. Reclamation would be concurrent with mining over the course of the estimated 25-year mine life and would be followed by a minimum of 10 years of reclamation and revegetation monitoring. Impacts are reported in terms of total acres of disturbance over the life of the mine; however, note that this disturbance would not all occur at one time.

Under the Proposed Action, approximately 1,975 acres of disturbance would occur in vegetated areas (see Table 4.17.1). Of this, dispersed facilities would be sited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible, with mitigation measures prescribed where it is not possible to avoid such disturbances. Underground mining would not directly impact overlying vegetation; however, impacts associated with underground mining could include hydrological changes and subsidence. Surface disturbance, consisting of the road and ROW, would occur for the reroute of KFO Route 116 in and outside the tract. Although the entire ROW would not be directly disturbed, for purposes of analysis, it is assumed that these areas would be nonfunctional as habitat for wildlife for the life of the mine. Following mining of the original roadbed, KFO Route 116 would be returned to its original route, and the temporary ROW would be reclaimed and restored. Under the Proposed Action, approximately 55% of the wildlife habitats in the tract would be removed by surface mining and associated disturbance. Reclamation would restore the disturbed areas for wildlife habitat. The timeframe for the restoration of habitat would vary by species, with restoration for species that use sagebrush habitats taking approximately 20 years, according to BLM’s experience with vegetation treatments completed locally.

Under this alternative, the activities that would contribute to noise and nighttime light impacts, as described in Section 4.2.5, would occur within the approximately 1,993 acres of surface disturbance and would persist for 25 years (the life of the mine under this alternative). Although the activities contributing to these impacts would occur within a 1,993-acre footprint of surface disturbance, the spatial extent of noise and lighting impacts would vary and move according to where the lights and noise generators are located within that footprint. A general description of noise and lighting impacts under the action alternatives is provided in Section 4.17.4.2.5.

Water use for dust suppression and the washing of equipment would occur over the 25-year mine life. Water sources would consist of groundwater accumulated in open pits and water pumped from existing wells or from wells established near the mine for coal mining purposes. Direct and indirect impacts to wildlife could result from surface-water depletions or from degradation of surface-water quality due to increased sediment loads from mining operations or spills of petroleum products and other hazardous materials. Direct impacts to wildlife that occupy wetlands or riparian habitats (see Table 4.17.1) would consist of habitat removal during mining and related disturbances. Indirect impacts would consist of loss of habitat and/or reduced habitat functioning (i.e., reduced water quality, reduced prey availability) as a result of water depletions or sedimentation of surface waters. The BLM's *Utah Riparian Management Policy* (IM UT-2005-091) requires that field offices, to the extent practicable, "protect riparian areas through sound management practices and avoid negative impacts to the maximum extent practicable" (BLM 2005a). The policy goes on to state that "[n]o new surface disturbing activities will be allowed within 100 meters of riparian areas unless it can be shown that:

a. there are not practical alternatives or,
b. all long term impacts can be fully mitigated or,
c. the activity will benefit and enhance the riparian area."

This riparian policy would help reduce impacts to riparian areas within the tract. See Section 4.16, Water Resources, for more detailed discussion of water use under the Proposed Action.

4.17.4.3.1 Big Game

The tract contains approximately 3,439 acres of substantial value summer habitat for mule deer and 138 acres of crucial summer habitat for mule deer. The tract also contains approximately 3,506 acres of substantial value summer habitat for elk and 71 acres of year-long substantial value habitat for elk. These big game species are likely to be displaced from crucial and substantial-value habitats on the tract during mining operations and development. In addition to the impacts described above (Section 4.17.4.2), direct impacts would consist of habitat loss, alteration, and fragmentation due to surface disturbance. When examining the effects of oil and gas development, Wilbert et al. (2008) conclude that even lower levels of development can have substantial effects on wildlife, including big game. The relocation of KFO Route 116 and pit disturbance are examples of surface disturbance that would affect mule deer and elk habitat through loss, alteration, and fragmentation. Deer and elk are also more likely to avoid buffer areas around heavily traveled roads, in comparison to lightly traveled roads (Forman et al. 1998). Other impacts would consist of disruption of movement and habitat use due to noise, night lighting, and increased human presence. As discussed in Lutz et al. (2003), mule deer avoided zones approximately 100–400 meters (328–1,312 feet) from roads or human presence, resulting in habitat unavailable to the species for foraging or cover in an area larger than the actual footprint of the disturbance. Disturbed habitat would have reduced forage and cover value until reclamation and restoration actions are complete (approximately 10 years post-mining activity). Reclaimed sites may have limited habitat value in early stages of succession, and may or may not fully return to their original habitat function in late successional stages. Over the life of the mine under the Proposed Action, surface-disturbing activities would ultimately remove 21% of crucial summer mule deer habitat in the tract (0.03% of the HMU), 52% of substantial value summer mule deer habitat in the tract (0.9% of the HMU), 35% of year-long substantial value elk habitat in the tract (2% of the HMU), and 52% of substantial value summer elk habitat in the tract (2% of the HMU) (see Table 4.17.1 and Map 3.20). No designated pronghorn habitats occur in the proposed tract. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

This reduction in available habitat would also reduce the food sources available to individuals, potentially reducing the health of some individuals. However, because surface-disturbing activities under the Proposed Action would impact less than 1% of crucial summer mule deer habitat and substantial value mule deer habitat within the HMU, there would be adjacent available habitat into which this species could disperse. Likewise, because surface-disturbing activities under the Proposed Action would impact only 2% of year-long substantial value habitat and substantial value summer habitat for elk, there would be adjacent available habitat into which this species could disperse.

Under the Proposed Action, an additional 0.8 acre of mule deer crucial summer, 0.2 acre of elk crucial summer, and 0.6 acre of elk year-long substantial value habitats on BLM-administered land adjacent to the tract would be disturbed to reroute KFO Route 116. The KFO Route 116 relocation would take place inside the tract; the acres of habitat removal are accounted for in Table 4.17.2. Although the new road location, along with increased mine-related traffic, would influence big game species movement patterns (discussed in section 4.17.5.2), the severity of these impacts over existing conditions would not substantially change. This is because the KFO Route 116 currently exists and is already influencing wildlife movement due to the presence of traffic. The KFO Route 116 relocation would, however, increase the impacts of habitat fragmentation on big game over current conditions by creating an additional vector for weeds and increasing edge habitat.

Impacts to big game species along the reasonably foreseeable coal haul transportation route are discussed in Section 4.17.5.2.1. Direct impacts to mule deer and elk habitats in the tract would be greater under the Proposed Action compared to the No Action Alternative. Implementation of the Proposed Action would result in the disturbance of 29 more acres of crucial summer mule deer habitat, 1,803 more acres of substantial value summer mule deer habitat, 1,808 more acres of substantial value summer elk habitat, and 25 more acres of year-long substantial value elk habitat than would occur under the No Action Alternative.

Table 4.17.2. Direct Impacts to Mule Deer and Elk Habitats in the Alton Coal Tract under the No Action and Action Alternatives

	Acres in HMU	Alternative A (No Action)	Alternative B (Proposed Action)			Alternative C (Reduced Tract Acreage and Seasonal Restrictions)			Alternative K1 (Reduced Tract Acreage)		
		Acres Disturbed	Acres in Tract	Acres Disturbed	Percentage Disturbed (tract/HMU)	Acres in Tract	Acres Disturbed	Percentage Disturbed (tract/HMU)	Acres in Tract	Acres Disturbed	Percentage Disturbed (tract/HMU)
Mule deer crucial summer	105,443	0	138.0	29.0	21.0%/0.03%	109.0	0.0	0%/0%	109.0	0.0	0%/0%
Mule deer substantial value summer	207,439	0	3,438.6	1,803.3	52.4%/0.9%	3,063.7	1,526.0	49.8%/0.7%	2,004.8	920.1	45.9%/0.4%
Elk substantial value summer	83,854	0	3,505.5	1,807.5	51.6%/2.2%	3,101.6	1,501.3	48.4%/1.8%	2,113.8	920.1	43.5%/1.1%
Elk year-long substantial value	175,970	0	71.1	24.8	34.9%/0.01%	71.1	24.8	34.9%/0.01%	0.0	0.0	0%/0%

Source: UDWR GIS data updated May 2006.

4.17.4.3.2 Raptors

The Proposed Action would result in direct adverse impacts to foraging and wintering habitats, and to active and inactive nest sites for raptor species. Raptor nesting occurs primarily in riparian habitats on approximately 55 acres (2%) of the tract, 6.7 acres of which would be directly impacted by mining activities under the Proposed Action over the life of the mine. Suitable potential raptor nesting sites would also be reduced by the removal of 694 acres of pinyon-juniper woodland. No bedrock, cliff, or canyon roosting and nesting habitat occurs in the tract, but several small habitat areas are adjacent to the tract's eastern boundary. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time. Raptor species are sensitive to human disturbance, especially during breeding periods (Romin et al. 2002). Disturbance from mining activities or human presence near an active nest during breeding season could result in nest abandonment and/or mortality of young from increased vulnerability to predators, temperature extremes, or reduced food intake due to avoidance of the nest site by adult raptors. Impacts to active nesting sites would be mitigated by raptor nest surveys and the resulting avoidance measures. However, if a nest area is disturbed outside the nesting season, there is a likelihood that the raptor would not return to the nest the following nesting season. Indirect impacts to nesting habitat from subsidence would be unlikely because underground mining operations would occur in the northeast corner of the tract, where there is little nesting habitat.

Raptor species would be directly impacted by habitat loss from pit disturbance and construction activities, and by the long-term loss of wooded foraging habitats (e.g., riparian, pinyon-juniper woodland, and mountain brush vegetation communities). They would also be impacted by the removal of perch and roost sites on and off tract, as required by the sage-grouse mitigation plan (see Appendix E) because this could contribute to reduced prey capture and a decreased ability to feed themselves and their chicks. Raptors forage in all habitat types, and the loss of foraging habitats due to direct disturbance or removal would result in the displacement of raptors from these areas until habitats have been successfully restored. Lastly, construction of roadways and mine-related traffic could result in increased mortality from vehicle strikes because many raptor species, especially owls, often forage 3–4 feet off the ground.

Special lease stipulations and BMPs would minimize adverse impacts to raptor species, especially during the breeding season, by providing spatial and seasonal buffers of both occupied and unoccupied nests. Compliance with the BLM Riparian Management Policy (IM UT-2005-091) (BLM 2005a) would help minimize or mitigate for impacts on riparian nesting habitat. Additionally, mitigation actions aimed at reducing corvid species in the area (ravens and crows, as required by the sage-grouse mitigation plan; see Appendix E) would reduce competition for nesting sites for some raptor species, and would reduce the potential for predation of raptor eggs.

Because a large portion of the tract would be disturbed during surface mining and associated activities over the life of the mine, the Proposed Action would result in greater short-term adverse impacts to raptor species and their habitats than would occur under the No Action Alternative. However, because raptors are highly mobile and there is an abundance of suitable habitat in the region surrounding the tract, there would be available habitat into which raptors could disperse.

4.17.4.3.3 Migratory Birds

Under the Proposed Action, direct adverse impacts to migratory birds would occur from the direct removal, alteration, or fragmentation of habitat during surface mining and associated activities. Loss of habitat would reduce forage, cover, perches, and nesting areas for migratory birds. Most surface disturbance under the Proposed Action would occur in sagebrush/grassland and sagebrush/grassland (treated) (914 acres) and pinyon-juniper woodland vegetation communities (694 acres) (Table 4.17.3). Therefore migratory bird species associated with these vegetation communities would be most greatly affected. In addition, 278 acres (86%) of annual and perennial grasses vegetation community would be directly disturbed and effectively lost for migratory bird species associated with this community. Under the Proposed Action, approximately 1,975 acres (56%) of migratory bird habitat would be disturbed by surface mining over the life of the mine. Because a large portion of the tract would be disturbed during surface mining and associated activities, the Proposed Action would result in greater short-term adverse impacts to migratory bird species and their habitats than would occur under the No Action Alternative. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time. Because migratory birds are highly mobile and there is an abundance of sagebrush/grassland and pinyon-juniper woodland vegetation communities in the region surrounding the tract, there would be available habitat in which migratory birds could disperse.

Impacts of night lighting on migratory birds are well studied. Impacts of increased lighting at night include altered biorhythms (singing at night), altered feeding patterns, increased exposure to predation, and increased competition with nocturnal species (de Molenaar et al. 2006). For many bird species, the length of the night influences hormones and breeding cues. Artificially increasing day length by the use of nighttime lighting could induce pre-mature breeding condition (de Molenaar et al. 2006). The proposed night lighting could also attract migrating birds and therefore alter the typical migration route, leading to decreased health of the individual and/or flock (Gauthreaux et al. 2006) as well as influencing hormonal cues and potentially prompting migration at the wrong time (de Molenaar et al. 2006). Altered migration timing may lead to species arriving at Arctic breeding sites too early, or conversely, remaining at summer sites too long and attempting migration with reduced fat reserves, ultimately decreasing the health of the individual and/or flock.

The predator control mitigation measure required by the sage-grouse mitigation plan (see Appendix E) would adversely impact ravens, because they would be targeted for removal to reduce predation on sage-grouse eggs. However, the vegetation treatments required in the mitigation plan would be beneficial for local populations of migratory bird species that use sagebrush habitats. This is because the vegetation treatments would create additional breeding and foraging habitat for these species.

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Table 4.17.3. Acreages and Direct Disturbance in the Alton Coal Tract by Vegetation Community and Associated Raptor and Migratory Bird Species Under the Action Alternatives

Vegetation Community	Associated Migratory Bird Species	Alternative B (Proposed Action)			Alternative C (Reduced Tract Acreage and Seasonal Restrictions)			Alternative K1 (Reduced Tract Acreage)		
		Acres in Tract	Acres Disturbed	Percentage Disturbed	Acres in Tract	Acres Disturbed	Percentage Disturbed	Acres in Tract	Acres Disturbed	Percentage Disturbed
Pinyon-juniper woodlands	Sharp-shinned Hawk, Cooper's Hawk, Black-throated Gray Warbler, Gray Vireo, Loggerhead Shrike, Virginia's Warbler, Black-capped Chickadee, Townsend's solitaire, Pinyon Jay, Red-naped Sapsucker	1,430.8	694.4	48.6%	1,410.2	680.1	48.2%	1,095.1	471.6	43.1%
Sagebrush/ grassland	Brewer's Sparrow, Sage Sparrow, Mountain Bluebird, Green-tailed Towhee, Sage Thrasher	860.2	366.5	42.6%	627.8	195.7	31.2%	369.1	91.2	24.7%
Sagebrush/ grassland (treated)	Brewer's Sparrow, Sage Sparrow, Mountain Bluebird, Green-tailed Towhee, Sage Thrasher	749.1	547.5	73%	749.1	546.1	73%	289.5	235.9	77%
Annual and perennial grasses	Peregrine Falcon, Prairie Falcon, Swainson's Hawk, Rough-legged Hawk (winter), Mountain Bluebird, Bendire's Thrasher	324.1	278.4	85.9%	247.0	196.5	76.6%	247.0	196.8	79.7%
Mountain brush	Black-throated Gray Warbler, Gray Vireo, Virginia's Warbler, Spotted Towhee, Gambel's Quail, Black-chinned Sparrow	62.8	24.9	39.6%	62.8	24.7	39.3%	40.8	1.7	4.2%
Wetland (meadow)	Lesser Goldfinch, Red-winged Blackbird	62.8	55.5	88.3%	0.0	0.0	0%	0.0	0.0	0%
Riparian	Northern Harrier, Red-tailed Hawk, Great-horned Owl, Western Screech-Owl, Downy Woodpecker, American Dipper, Yellow-breasted Chat, Yellow Warbler	55.3	6.7	12.1%	54.0	6.3	11.7%	54.0	6.4	11.9%
Rabbitbrush	Gambel's Quail, Brewer's Sparrow, Sage Sparrow, Mountain Bluebird, Green-tailed Towhee, Sage Thrasher	10.7	1.0	9.2%	10.7	1.0	8.0%	10.7	1.0	9.3%
Total		**3,555.8**	**1,974.8**	**55.5%**	**3,161.6**	**1,650.3**	**52.2%**	**2,106.2**	**1,004.6**	**47.7%**

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4.17.4.3.4 Amphibians

Impacts to amphibian species from mining activities include habitat fragmentation and loss, displacement to lower quality habitats, increased exposure to predators from cover removal, crushing and burial of adults and young, toxins (MgCl), possible sedimentation, and attraction to ecological 'traps' such as water holding ponds. Potential habitats for amphibian species in wetland (meadow) and riparian vegetation communities comprise approximately 118 acres (3%) of the tract. Under the Proposed Action, approximately 53% (63 acres) of wetland and riparian habitats would be removed by mining and associated activities (see Table 4.17.1). These impacts would affect individuals, but due to the limited availability of potential habitats on the site, they would not likely affect entire populations of amphibian species. Because a portion of the tract would be disturbed during surface mining and associated activities, the Proposed Action would result in greater short-term adverse impacts to amphibian habitats than would occur under the No Action Alternative. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

Increased nighttime lighting is known to attract amphibian species to the light source, resulting in altered foraging patterns, increased risk of being struck by vehicles, and changes in behavior (i.e., reproduction and predator-avoidance) (Buchanan 2006). Tadpole behavior also is altered with increased illumination. Sustained nighttime lighting could lead to decreased health of local amphibian populations.

4.17.4.4 ALTERNATIVE C: REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS

Under Alternative C, the nature of impacts would be the same as under the Proposed Action, but would differ in the acres of disturbance and timing of mine-related activities. The tract would encompass approximately 3,173 acres due to the exclusion of Block NW. Under Alternative C, approximately 1,650 acres of disturbance would occur in vegetated areas over approximately 21 years (see Table 4.17.1). Dispersed facilities would be sited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible, with mitigation measures prescribed where it is not possible. Timing restrictions designed to reduce impacts to Greater Sage-Grouse in Block S would be implemented to reduce impacts to the local lek and sage-grouse population that occupies portions of the tract during the nesting and brooding periods. These timing restrictions would alter the timing and distribution of mining activities, and would reduce impacts to other wildlife species that use sagebrush habitats.

Alternative C would require that two pits (totaling approximately 240 acres) are open simultaneously so the selected lessee could comply with the Greater Sage-Grouse timing restrictions by mining outside the lek buffer during the breeding time period. However, only one pit would be active at any one time, and the other pit would sit idle. This alternative would require the use of additional heavy equipment because of the two pits. In addition, a stockpiling area for approximately 40–60 acres of overburden would be required for two simultaneously open pits. At any one time, there would be approximately 240 acres of open surface-mining pits and an additional 240 or more acres in some stage of reclamation. Reclamation would be concurrent with mining over the course of the estimated 21-year mine life and would be followed by an up to 10-year reclamation and revegetation monitoring period, with reclamation activities potentially extended for some pits due to timing restrictions for sage-grouse. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

Relocation of KFO Route 116 would not be required in Block NW under this alternative because this portion of the tract would not be included (see Map 2.2). Relocation of KFO Route 116 elsewhere in the tract would require approximately 36 acres of surface disturbance, with an additional 0.6 acre of disturbance outside of the tract. As described for the Proposed Action, for purposes of analysis, the entire 36.6 acres is assumed to be nonfunctional as habitat for wildlife for the life of the mine. The reroute would be cited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible; the exact location of the reroute would be finalized during the permitting phase of the project. Under Alternative C, approximately 52% of wildlife and special status species habitats in the tract would be directly impacted by surface disturbance. Water use for dust suppression and the washing of equipment would occur over the 21-year mine life. Water sources would consist of groundwater accumulated in open pits and water pumped from existing wells or wells established near the mine for coal mining purposes. Impacts to wildlife would be the same as would occur under the Proposed Action. See Section 4.16 for more detailed discussion of water use.

4.17.4.4.1 Big Game

Under Alternative C, the nature of impacts to wildlife occurring in the tract analysis area would be the same as described for the Proposed Action and in the Impacts Common to the Action Alternatives section. Over the life of the mine, surface-disturbing activities would ultimately impact 1,526 acres (50% of the tract and 0.7% of the HMU) of substantial value summer mule deer habitat, 1,501 acres (48% of the tract and 1.8% of the HMU) of substantial value summer elk habitat, and 25 acres (35% of tract and 0.01% of the HMU) of year-long substantial value elk habitat (see Table 4.17.2 and Map 3.20). An additional 0.6 acre of mule deer crucial summer and 0.6 acre of elk year-long substantial value habitats on BLM-administered land adjacent to the tract would be disturbed for the reroute of KFO Route 116. Noise and nighttime light impacts would be the same as those described in Section 4.2.5 and under the Proposed Action, except that they would occur on 331 fewer acres and for a shorter duration of 21 years (the mine life under this alternative). Direct impacts to mule deer and elk habitats in the tract would be greater under Alternative C compared to the No Action Alternative. No designated pronghorn habitats occur on or adjacent to the tract under Alternative C. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

Because surface-disturbing activities under Alternative C would impact less than 1% of substantial value mule deer habitat within the HMU, there would be available habitat in which this species could disperse. Likewise, because surface-disturbing activities under Alternative C would impact a total of less than 2% of year-long substantial value habitat and substantial value summer habitat for elk, there would be available habitat in which this species could disperse.

4.17.4.4.2 Raptors

Under Alternative C, raptor species would be directly impacted by habitat loss from pit disturbance and construction activities, and by the long-term loss of wooded foraging habitats (e.g., riparian, pinyon-juniper woodland, and mountain brush vegetation communities). The nature of impacts to raptor species would be the same as described for the Proposed Action. The increased risk of direct mortality of ground-nesting raptor species from pit development and construction equipment would be reduced by the elimination of Block NW and by timing stipulations in Block S. Suitable raptor nesting sites would likely be reduced by the removal of 680 acres of pinyon-juniper woodland. Because a portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to raptor species and their suitable habitats than would occur under the No Action. As under the Proposed Action, special lease stipulations and BMPs would minimize adverse impacts to raptor species, especially during the breeding season, by providing spatial and seasonal buffers of both occupied and unoccupied nests. Because raptors are highly mobile and there is an abundance of suitable habitat in the region surrounding the tract, there would be available habitat in which raptors could disperse.

4.17.4.4.3 Migratory Birds

Under Alternative C, direct adverse impacts to migratory birds would occur from the direct removal, alteration, or fragmentation of habitat during surface mining and associated activities. The nature of impacts to migratory bird species would be the same as described for the Proposed Action. Most surface disturbance under Alternative C would occur in sagebrush/grassland and sagebrush/grassland (treated) (742 acres) and pinyon-juniper woodland vegetation communities (680 acres) (see Table 4.17.3). Therefore, migratory bird species associated with these vegetation communities would be the most greatly affected. In addition, 197 acres (80%) of annual and perennial grasses would be directly disturbed and effectively lost for migratory bird species associated with this vegetation community. Under Alternative C, approximately 1,650 acres (52%) of suitable migratory bird habitat in the tract would be disturbed by surface mining over the 21-year mine life (see Table 4.17.3). Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to migratory bird species and their suitable habitats than would occur under the No Action Alternative. Because migratory birds are highly mobile and there is an abundance of sagebrush/grassland and pinyon-juniper woodland vegetation communities in the region surrounding the tract, there would be available habitat in which migratory birds could disperse.

4.17.4.4.4 Amphibians

Impacts to amphibian species from mining activities include habitat fragmentation and loss, displacement to lower quality habitats, increased exposure to predators from cover removal, crushing and burial of adults and young, and attraction to ecological ‘traps’ such as water holding ponds. The nature of impacts to amphibian species would be the same as described for the Proposed Action. None of the wetland (meadow) vegetation community would be directly disturbed under Alternative C. However, approximately 6 acres of riparian vegetation community would be disturbed under this alternative. Because a portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to amphibian species’ vegetation communities than would occur under the No Action Alternative. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

4.17.4.5 ALTERNATIVE K1: REDUCED TRACT ACREAGE

Under Alternative K1, the nature of impacts would be the same as under the Proposed Action and Alternative C, but would differ in the acres of disturbance, or magnitude. Alternative K1 would exclude both Block NW and Block S from mining activities. The tract would encompass approximately 2,114 acres due to the exclusion of Block NW and Block S. Under Alternative K1, approximately 1,012 acres of surface disturbance would occur over approximately 16 years (see Table 4.17.1). Dispersed facilities would be sited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible, with mitigation measures prescribed where it is not possible. Under Alternative K1, there would be a single open pit (approximately 120 acres), and at any one time there would be approximately 120 acres of open surface-mining pit disturbance and an additional 120 or more acres in some stage of reclamation. Reclamation would be concurrent with mining over the course of the estimated 16-year mine life and would be followed by an up to 10-year reclamation and revegetation monitoring period, with reclamation activities potentially extended for some pits due to timing restrictions for sage-grouse. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

Relocation of KFO Route 116 would not be required in Block NW under this alternative because this portion of the tract would not be included in the lease (see Map 2.3). Relocation of KFO Route 116 elsewhere in the tract would require approximately 16 acres of surface disturbance. As described for the

Proposed Action, for purposes of analysis, the entire 16 acres are assumed to be nonfunctional as habitat for wildlife for the life of the mine. The reroute would be cited to avoid disturbances to wetlands, floodplains, stream channels, and intact sagebrush stands wherever possible. Under Alternative K1, approximately 48% of wildlife habitats in the tract would be directly impacted by surface disturbance.

Water use for dust suppression and the washing of equipment would occur over the 16-year mine life. Water sources would consist of groundwater accumulated in open pits and water pumped from existing wells or wells established near the mine for coal mining purposes. Impacts to wildlife would be the same as under the Proposed Action and Alternative C. See Section 4.16 for more detailed discussion of water use.

4.17.4.5.1 Big Game

Under Alternative K1, the nature of impacts to big game occurring in the tract analysis area would be the same as described for the Proposed Action, Alternative C, and in the Impacts Common to the Action Alternatives section. Over the life of the mine, surface-disturbing activities would ultimately impact approximately 920 acres (45.9% of the tract and 0.4% of the HMU) of substantial value summer mule deer habitat, and approximately 920 acres (43.5% of the tract and 1.1% of the HMU) of substantial value summer elk habitat (see Table 4.17.2 and Map 3.20). Noise and nighttime light impacts would be the same as those described in Section 4.17.5.2 and under the Proposed Action, except that they would occur on 981 fewer acres and for a shorter duration of 16 years (the life of the mine under this alternative). Direct impacts to mule deer and elk habitats in the tract would be greater under Alternative K1 compared to the No Action Alternative. No designated pronghorn habitats occur on or adjacent to the tract under Alternative K1. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time. Because surface-disturbing activities under Alternative K1 would impact less than 1% of substantial value mule deer habitat within the HMU, there would be available habitat into which this species could disperse. Likewise, because surface-disturbing activities under the Proposed Action would impact less than 2% of substantial value summer habitat for elk, there would be available habitat into which this species could disperse.

4.17.4.5.2 Raptors

Under Alternative K1, raptors would be impacted by suitable habitat loss from pit disturbance and construction activities, and by the long-term loss of wooded foraging habitats (e.g., riparian, pinyon-juniper woodland, and mountain brush vegetation communities). The nature of impacts to raptor species would be the same as described for the Proposed Action. The increased risk of direct mortality of ground-nesting raptor species, such as Northern Harrier, from pit development and construction equipment would be reduced by the exclusion of Block NW and Block S from mining activities. Suitable raptor nesting sites would likely be reduced by the removal of 472 acres (43%) of pinyon-juniper woodland. Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to raptor species and their suitable habitats than would occur under No Action. As under the Proposed Action and Alternative C, special lease stipulations and BMPs would minimize adverse impacts to raptor species, especially during the breeding season, by providing spatial and seasonal buffers of both occupied and unoccupied nests. Because raptors are highly mobile and there is an abundance of suitable habitat in the region surrounding the tract, there would be adequate habitat in which raptors could disperse.

4.17.4.5.3 Migratory Birds

Under Alternative K1, direct adverse impacts to migratory birds would occur from the direct removal, alteration, or fragmentation of suitable habitat during surface mining and associated activities. The nature of impacts to migratory bird species would be the same as described for the Proposed Action and Alternative C. Most surface disturbance under Alternative K1 would occur in sagebrush/grassland and sagebrush/grassland (treated) (327 acres) and pinyon-juniper woodland vegetation communities (472 acres) (see Table 4.17.3). Therefore, migratory bird species associated with these vegetation communities would be most greatly affected. In addition, 197 acres (80%) of annual and perennial grasses would be directly disturbed and effectively lost for migratory bird species associated with this community. Under Alternative K1, approximately 1,005 acres (48%) of migratory bird habitat in the tract would be disturbed by surface mining over the 16-year mine life (see Table 4.17.3). Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to migratory bird species and their suitable habitats than would occur under the No Action Alternative. Because migratory birds are highly mobile and there is an abundance of sagebrush/grassland and pinyon-juniper woodland vegetation communities in the region surrounding the tract, there would be adequate habitat in which migratory birds could disperse.

4.17.4.5.4 Amphibians

Impacts to amphibian species from mining activities include habitat fragmentation and loss, displacement to lower quality habitats, increased exposure to predators from cover removal, crushing and burial of adults and young, and attraction to ecological ‘traps’ such as water holding ponds. The nature of impacts to amphibian species would be the same as described for the Proposed Action and Alternative C. None of the wetland (meadow) vegetation community would be directly disturbed under Alternative K1. However, approximately 6.4 acres of the riparian vegetation community would be disturbed under this alternative. Because a portion of the tract would be disturbed during surface mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to amphibian species’ vegetation communities than would occur under the No Action Alternative.

4.17.5 Impacts from Coal Hauling

There would be no additional loss of wildlife habitat from the reasonably foreseeable coal haul transportation route. Coal transportation would occur on existing roads and would not necessitate road upgrades. The following analysis focuses on direct and indirect impacts to wildlife from increased rates of traffic.

Wildlife mortality along highways and roads is facilitated by the presence of open foraging areas along the roadside, and by the need for road crossings during daily or seasonal movements (BLM 1995; USDOT 1975). Wildlife mortalities along highways and roads is most likely to occur from dusk to dawn, when wildlife may be more active and motorist visibility is reduced, and during seasonal migrations when wildlife are more likely to cross roads. Impacts from coal truck traffic on wildlife would vary according to the individual’s size, mobility, and movements; large, nocturnal species and migratory species such as mule deer, elk, and pronghorn would be at the greatest risk. An increase in vehicle collision mortality of raptors and other bird species could also occur due to birds scavenging roadkill, and would be proportional to the volume of other animal mortalities. The attraction of raptors to any increase in roadkill could also result in an increase in raptor predation of small animal species in habitats adjacent to the reasonably foreseeable coal haul transportation route.

4.17.5.1 ALTERNATIVE A: NO ACTION

Wildlife mortalities along US-89, SR-20, I-15, and SR-56 are likely to increase due to additions of mine-related traffic from existing fee coal mine areas adjacent to the tract that would use existing routes (see Section 4.19). A large portion of the reasonably foreseeable coal haul transportation route would be adjacent to wildlife and special status species habitats (Table 4.17.4). From 2003 to 2005, wildlife-related single-vehicle crashes made up 51% of crashes on US-89, 18% of crashes on US-20, 11% of crashes on I-15, and 41% of crashes on SR-56 (Fehr & Peers Transportation Consultants 2013). Wildlife mortality and associated disruptions in habitat use and migration routes would be expected to occur under both the No Action Alternative and the action alternatives. However, mine-related traffic and associated wildlife impacts would be minimized under the No Action Alternative due to the expected lower volume of truck traffic.

Table 4.17.4. Land Cover Miles Adjacent to the Reasonably Foreseeable Coal Haul Transportation Route and Associated Wildlife Under the No Action and Action Alternatives

Cover Type	Associated Wildlife Species	Miles	Percentage of Route
Sagebrush	Elk, mule deer, pronghorn, Brewer's Sparrow, Sage Sparrow, Green-tailed Towhee, Sage Thrasher	49.4	43.1%
Developed	American Kestrel, Western Kingbird, American Robin, Brown-headed Cowbird, Brewer's Blackbird	41.6	36.3%
Pinyon-juniper woodland	Elk, Sharp-shinned Hawk, Cooper's Hawk, Black-throated Gray Warbler, Gray Vireo, Loggerhead Shrike, Virginia's Warbler, Townsend's Solitaire, Pinyon Jay, Red-naped Sapsucker	11.7	10.2%
Agriculture	Elk, mule deer, pronghorn, Peregrine Falcon, Prairie Falcon, Swainson's Hawk, Say's Phoebe, Western Kingbird	7.3	6.4%
Shrub-steppe	Elk, mule deer, pronghorn, Brewer's Sparrow, Sage Sparrow, Green-tailed Towhee, Sage Thrasher	0.2	0.2%
Woodland-shrubland	Elk, Black-throated Gray Warbler, Gray Vireo, Virginia's Warbler, Ash-throated Flycatcher, Black-capped Chickadee, Spotted Towhee, Black-chinned Sparrow	2.2	1.9%
bedrock, cliff, and canyon	Peregrine Falcon, Prairie Falcon, Rock Wren	1.1	1.0%
Grassland (native and invasive grasses/forbs)	Elk, mule deer, pronghorn, Rough-legged Hawk (Winter), Mountain Bluebird, Bendire's Thrasher	0.2	0.2%
Open water	Mallard, shorebirds, fish, amphibians	< 0.1	< 0.1%
Salt desert scrub	Pronghorn, Bendire's Thrasher, Black-chinned Sparrow, Brewer's Sparrow, Gambel's Quail, Loggerhead Shrike, Lucy's Warbler, Mountain Plover, Northern Harrier, Prairie Falcon, Sage Sparrow, Black-throated Sparrow, Gambel's Quail	< 0.1	< 0.1%
Riparian	Red-tailed Hawk, Great-horned Owl, Western Screech-Owl, Broad-tailed Hummingbird, Gambel's Quail, Lucy's Warbler, Peregrine Falcon, Downy Woodpecker, American Dipper, Yellow-breasted Chat, Yellow Warbler	0.8 40.8 acres*	0.7%
Total		**114.7 miles**	**100.0%**

Notes: Scientific nomenclature for all wildlife species in this EIS is introduced in Chapter 3.

Acres of riparian habitat within 100-feet of the reasonably foreseeable coal haul transportation route are also included to assess potential impacts in the unlikely event of a coal truck accident in close proximity to this cover type.

Land cover miles are the same for all three action alternatives because the reasonably foreseeable coal haul transportation route is the same for all alternatives.

* The analysis area for riparian also includes acres of habitat within a 100-foot buffer of the reasonably foreseeable coal haul transportation route.

4.17.5.2 ALTERNATIVE B (PROPOSED ACTION), ALTERNATIVE C (REDUCED TRACT ACREAGE AND SEASONAL RESTRICTIONS), AND ALTERNATIVE K1 (REDUCED TRACT ACREAGE)

Under the Proposed Action, Alternative C, and Alternative K1, the addition of coal trucks and other mine-related traffic is expected to generate an additional 160 employee round-trips per day on existing roadways, and 153 truck round-trips over each 24-hour period, or six trucks each way per hour, along the reasonably foreseeable transportation route (approximately 115 miles from Alton via US-89 to US-20 to I-15 to SR-56 to Iron Springs). Coal trucks are expected to leave the mine at nine- to 10-minute intervals, with a truck passing any given point along the route approximately every five minutes. The increase in ADT from employee and service round-trips and coal trucks is estimated at 4% on US-89 and 2% on SR-56 compared to the No Action Alternative (see Section 4.14.3). Coal truck traffic would increase average, daily, heavy truck volume of 28%–43% along US-89 and US-20 (Fehr & Peers Transportation Consultants 2013).

Wildlife-related vehicle accidents accounted for 126 (approximately 51%) of single-vehicle accidents on US-89 (from Glendale to junction with SR-20) between 2003 and 2005 (see Appendix H, transportation study). These accidents occurred before mining operations at the Coal Hollow Mine. Wildlife-related vehicle accidents accounted for 12 (approximately 18%) single-vehicle accidents on SR-20 (from I-15 to junction with US-89) between 2003 and 2005. Wildlife-related vehicle accidents accounted for 39 (approximately 11%) single-vehicle accidents on I-15 (from Cedar City to SR-20) between 2003 and 2005. Wildlife-related accidents accounted for 34 (approximately 41%) single vehicle accidents on SR-56 (from Milepost 9.80 to Milepost 61.39) between 2003 and 2005.

There would be an increased risk of wildlife mortality from vehicle collisions along the reasonably foreseeable coal haul transportation route, particularly due to the relative increase in nighttime truck traffic. Wildlife would also be impacted by disruption of diurnal or nocturnal activities from traffic-related noise. Because wildlife habitats occur adjacent to a large portion of the reasonably foreseeable coal haul transportation route (see Table 4.17.4), there would be an increased risk of mortality from vehicle collisions and greater impacts from traffic-related noise due to an increase in coal truck traffic. Ambient noise levels of 40 dBA could increase to 56–68 dBA due to haul truck traffic. There would also be an increased risk of sedimentation or contamination of the Sevier River drainage system from accidental spillage of coal associated with increased coal truck traffic.

Any increase in roadkill could increase raptor activity along the reasonably foreseeable coal haul transportation route. The proportional increase in truck traffic at night would be considerably higher than daily traffic proportional volume increases (BLM 1995) (see Section 4.14). Coal truck traffic would not be reduced by timing restrictions on Block S under Alternative C, because of the operation of a second pit that would allow mining at all times. Direct and indirect impacts to wildlife would be greater under the Proposed Action, Alternative C, and Alternative K1 compared to the No Action Alternative. The duration of the impacts among the action alternatives would differ according to the lengths of mine life. Under the Proposed Action, coal would be transported during a 25-year mine life, Alternative C would transport coal during a 21-year mine life, and Alternative K1 would transport coal during a 16-year mine life.

Roads can also effectively act as a movement barrier to some wildlife species, especially when the road is wide, paved, and handles high amounts of traffic. Traffic would be increased from the presence of coal haul trucks on the reasonably foreseeable coal haul transportation route. Species that are most susceptible to barrier effects are those that tend to avoid roads and also require large tracts of habitat for survival (Forman et al. 2003), such as bobcat, mountain lion, and elk. Other wildlife groups vulnerable to these effects include small mammal and amphibian species. Because of the presence of roads and barrier effects (which reduce landscape connectivity), these species are more susceptible to reduced gene flow and a reduced regional population size. Many wildlife species are therefore at a greater risk of a reduction in the regional population size due to the presence of roads and increased traffic on existing roads.

4.17.5.2.1 Big Game

Mule deer are the primary big game animal affected by highway traffic in the United States, with an estimated 1 million deer-vehicle collisions annually (Conover et al. 1995). As discussed for Alternative A, wildlife accounted for a considerable portion of the vehicle accidents that occurred on the reasonably foreseeable coal haul transportation route from 2003 to 2005 (Fehr & Peers Transportation Consultants 2013). The factors contributing to deer-vehicle collisions are traffic volume, deer density, and higher vehicle speeds (Sullivan et al. 2003). As a result, vehicle-related mortality of mule deer along the reasonably foreseeable coal haul transportation route would be proportional to mule deer density and the speed and volume of traffic relative to deer movements and concentrations. Traffic timing is also a factor; the greatest potential for mule deer fatalities from truck traffic most likely occur during spring and fall migrations and during morning and evening hours, when deer are most active. Traffic impacts to elk and pronghorn would also be proportional to the density of animals, and the timing, speed, and volume of traffic relative to their movements. Under the No Action Alternative, coal transport from the tract along US-89, SR-20, I-15, and SR-56 would not occur as a function of mining because the tract would not be offered for lease sale. However, coal haul traffic from the existing adjacent mine would continue. Under the Proposed Action, Alternative C, and Alternative K1, a large portion of the reasonably foreseeable coal haul transportation route would be adjacent to crucial winter mule deer habitat (81%), crucial winter elk habitat (49%), and crucial year-long pronghorn habitat (49%) (Table 4.17.5). This suggests that impacts to mule deer and elk would be more likely in the winter, and impacts to pronghorn would be probable year-long. Although the estimated increase in ADT is estimated to be from 2% to 4% along the route, there would be a proportionally greater increase in nighttime traffic due to the 24-hour coal truck activity. See Section 4.14 (Transportation) for a more detailed discussion of projected traffic increases.

Table 4.17.5. Miles of Mule Deer, Elk, and Pronghorn Habitats Adjacent to the Reasonably Foreseeable Coal Haul Transportation Route Under the No Action and Action Alternatives

	Miles	Percentage of Route
Mule Deer Habitats		
Crucial winter	21.2	18.4%
Crucial summer	18.6	16.2%
Substantial value year-long	11.7	10.2%
Substantial value winter	10.2	8.9%
Elk Habitats		
Substantial value winter	15.8	13.7%
Substantial value summer	10.4	9.0%
Pronghorn Habitats		
Crucial winter	5.9	5.1%
Crucial year-long	54.0	47.0%

Source: UDWR GIS data updated May 2012

In addition to impacting big game while on their seasonal habitats, there is potential for coal hauling to impact mule deer, elk, and pronghorn when they move between seasonal habitats along established migration routes. All of these species currently follow migration routes that cross the reasonably foreseeable coal transportation route multiple times, as described in Section 3.17.2.1. A broad-scale pattern exists for big game to use the mountainous habitat north of the tract in the summer and desert habitat south of the tract in the winter, especially mule deer and elk. Increasing collision potential during migration could impact regional big game populations to a greater degree than when the animals are stationary because herds from far-ranging seasonal habitats could be moving through the area. Impacts during migration have potential to reduce population health for herds throughout the region. Furthermore, increased traffic on roads that intersect migration routes increases the magnitude of existing road barrier effects. Road barrier effects refer not only to increased potential for vehicle collisions, but increased potential for migration routes to be altered and high-quality habitats not to be reached because of the tendency to avoid road crossings.

4.17.5.2.2 Raptors

Increased coal truck traffic could result in direct adverse impacts to raptors from vehicle strikes. The increase in traffic volume would likely result in increased roadkills of other wildlife species, which would attract raptors to the reasonably foreseeable coal haul transportation route and increase the likelihood of raptor mortality from vehicle collisions. Raptor foraging and nesting habitats in sagebrush, pinyon-juniper woodland, agriculture, shrub-steppe, woodland-shrubland, grassland, salt desert scrub, and riparian cover types occur adjacent to approximately 72 miles (62%) of the reasonably foreseeable coal haul transportation route (see Table 4.17.4). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to raptor species would likely be greater than would occur under the No Action Alternative.

4.17.5.2.3 Migratory Birds

Increased coal truck traffic would likely result in limited adverse impacts to migratory bird species adjacent to the reasonably foreseeable coal haul transportation route. Nevertheless, increased traffic volume could result in increased mortality from vehicle strikes. Foraging and nesting habitats for migratory bird species in sagebrush, pinyon-juniper woodland, agriculture, shrub-steppe, woodland-shrubland, grassland, and salt desert scrub cover types occur adjacent to approximately 71 miles (62%) of the reasonably foreseeable coal haul transportation route (see Tables 4.17.3 and 4.17.4). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to migratory bird species would likely be greater than would occur under the No Action Alternative.

4.17.5.2.4 Amphibian Species

Increased coal truck traffic would likely result in limited adverse impacts to amphibian species occurring along the reasonably foreseeable coal haul transportation route. Nevertheless, increased traffic volume could result in increased mortality from vehicle strikes. Amphibian habitat in pinyon-juniper woodlands occur adjacent to approximately 12 miles (10%) of the reasonably foreseeable coal haul transportation route (see Table 4.17.4). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to amphibians would likely be slightly greater than would occur under the No Action Alternative.

4.17.5.2.5 Fish

Fish, primarily trout species, occur in habitats adjacent to the reasonably foreseeable coal haul transportation route. Due to the expected increase in the volume of coal truck traffic associated with mining operations, there is increased potential for accidental coal spills to stream habitats along the reasonably foreseeable coal haul transportation route. Approximately 0.8 mile (0.7%) of the reasonably foreseeable coal haul transportation route transects stream habitats where there is the potential for a coal truck spill into the waterway. Stream and riparian habitats occur on 40.8 acres of riparian habitat within 100 feet of the reasonably foreseeable coal haul transportation route. Although the risk of a spill to this small portion of the route is negligible, the introduction of coal, petroleum products, or other hazardous materials from a coal truck spill could directly or indirectly adversely impact fish species and their habitats by causing mortality of individual fish or prey species from poisoning, or from loss of habitat due to reduced water quality or other habitat features.

4.17.6 Potential Mitigation Measures

Protective measures for wildlife species described above and in Management and Considerations Common to Each Action Alternative in Chapter 2 would mitigate and/or minimize impacts to wildlife resources in the tract. Potential mitigation measures for wildlife species include those listed below. BLM will incorporate selected mitigation measures into the ROD for this EIS.

- Install fencing and/or netting or other protective features around evaporation and production pits to reduce mortality of wildlife (e.g., migratory birds, raptors, and bats) due to drowning or entrapment.
- Design fences proposed in big game habitat to reduce impacts to big game movement. BLM would consult with UDWR on the design and location of new fences and in rebuilding old fence lines.
- Cooperate with UDWR to contribute funds to big game habitat improvement projects in the Paunsaugunt Management Unit by improving 4 acres of habitat for every acre of habitat disturbed.
- Cooperate with UDWR to contribute funds to local conservation easements that benefit wildlife.

To reduce road and haul truck impacts on wildlife, potential mitigation measures include the following:

- Install deer ‘whistles’ on coal haul trucks to reduce potential wildlife mortality.
- Install solar-powered flashing signs at critical crossings during hazardous seasons (i.e., migration and winter) for deer and elk.
- If practical and economic, do not conduct coal hauling one hour before sunrise, one hour after sunrise, one hour before sunset, and one hour after sunset to avoid crepuscular periods.
- Work with BLM, UDWR, and UDOT to ensure wildlife fencing, ramps, and crosswalks are installed at appropriate locations throughout the transportation route.
- Work with UDOT to seed plant species unpalatable by big game species in road ROWs to reduce big game/vehicle collisions.
- Cooperate with UDWR to contribute funds to help fund wildlife crossing projects along the haul route.
- Cooperate with UDWR to contribute funds to efforts to monitor or research wildlife highway mortalities along the haul route.

To reduce nighttime lighting impacts on wildlife, measures include the following:

- Place shields on all lights to focus light downward and reduce light scatter.
- Implement dust control measures. See the Air Resources section of Chapter 4 for specific measures.
- Limit the use of blue-rich white light where practical (in compliance with MSHA regulations), because research suggests blue-rich white light can heighten response in species (IDA 2010).

To reduce noise impacts on wildlife, measures include the following:

- If practical and economic, use equipment with lower sound power levels than the ones that were modeled.
- If practical and economic, reduce nighttime hours of operation in certain areas of the mine.
- If practical and economic, build a noise attenuating wall.

4.17.7 Unavoidable Adverse Impacts

Unavoidable adverse impacts would occur where the loss of wildlife occurs during mining pit disturbance, soil stockpiling, road and infrastructure development, or regular mine operations. Unavoidable loss could occur where wildlife are not detected or identified during surveys. Unavoidable loss of wildlife due to nondetection or inadvertent adverse impacts would also occur. There would also be unavoidable, short-term loss of wildlife habitats and individuals as a result of mining operations.

4.17.8 Short-term Uses versus Long-term Productivity

The short-term use of the tract for coal extraction would result in reduced structural and compositional diversity and reduced long-term productivity of wildlife habitats. The habitats present in the proposed tract are typically slow to recover from disturbance and productivity would be limited during reclamation and restoration activities. Long-term productivity would be reduced because vegetation communities would not develop immediately following mining and restoration activities. Until they are fully developed, these habitats would be less diverse and less productive, particularly if critical habitat components such as biological soil crusts and other soil properties have been lost. Effective implementation of the mitigation measures outlined above would minimize impacts to the long-term productivity of these vegetation communities and the wildlife that rely on them.

4.17.9 Irreversible and Irretrievable Commitments of Resources

Under the Proposed Action, Alternative C, and Alternative K1, the vegetation communities relied on as wildlife forage and cover that would be removed for surface mining would be irretrievably altered during the life of the mine. Once impacted by surface mining, dispersed and centralized facilities, roads, and ROWs, the productivity of vegetation communities would be irretrievably removed or reduced until reclamation and restoration have been completed. The loss of wildlife from mining and associated activities and from coal truck strikes along the reasonably foreseeable coal haul transportation route would constitute an irreversible commitment of the resource because these individuals would be permanently lost.

4.18 Wildlife: Special Status Species

This section assesses the environmental consequences of Alternative A (No Action), Alternative B (Proposed Action), Alternative C, and Alternative K1 on one federally endangered species, one federally threatened species, one federal candidate species, and 23 State of Utah/BLM sensitive species with potential to occur on the proposed Alton Coal Tract and the reasonably foreseeable coal haul transportation route. Collectively, these species are referred to as *special status species*. Special status species have limited distributions or numbers, and they generally have specific habitat requirements. If these species are lost, displaced, or if their habitat is altered, there is limited potential for relocation or reestablishment elsewhere. As a result, impacts to special status species must be assessed according to factors that are most important for their maintenance or recovery, or to prevent their listing as threatened or endangered. Impacts to special status wildlife species would be avoided to some degree through conservation and/or mitigation measures. However, both direct and indirect impacts to special status species are expected to result from minerals development and construction activities in the tract, as proposed under the action alternatives, and from traffic changes on the reasonably foreseeable coal haul transportation route, both of which could affect individuals, populations, or habitat conditions.

This section is divided into two distinct subsections. The first provides impacts analysis for all special status wildlife species except Greater Sage-Grouse (4.18.1). The second provides analysis only for the Greater Sage-Grouse (4.18.2). The intent of separating out the sage-grouse discussion is to prevent confusion or misunderstanding surrounding impacts on this species by providing all relevant information on the species in an organized and readable fashion. In this section, *short term* refers to the period when the development of the mine and the mining of coal would occur. *Long term* refers to impacts that occur and remain during coal mining and impacts that continue into the period following the reclamation and monitoring period.

4.18.1 Special Status Species (except Greater Sage-Grouse)

4.18.1.1 REGULATORY FRAMEWORK AND ADDITIONAL DESIGN FEATURES

4.18.1.1.1 Regulatory Framework

Numerous federal and state regulations shape the management of special status wildlife species. Regulations that pertain to special status species and potential impacts from mining and other land uses include, but are not limited to, the following:

- The Bald Eagle Protection Act of 1940, as amended, establishes penalties for taking, possessing, selling, purchasing, or bartering bald and golden eagles. It also provides for cancellation of the lease, license, or other federal land use authorization for anyone convicted of violating the act or any of its implementing regulations or permits.
- The Fish and Wildlife Coordination Act of 1958 mandates equal consideration of wildlife conservation with other features of water resource development programs. It requires that damage to fish and wildlife resources be prevented and that these resources be developed and improved.
- The ESA of 1973, as amended, requires the BLM to ensure that proposed actions do not jeopardize the continued existence of a threatened or endangered species and do not cause its critical habitat to be modified or destroyed.
- FLPMA of 1976 recognizes wildlife as a principal land use, requires consideration of wildlife objectives in commodity-oriented programs, and authorizes use of range-betterment funds for enhancement of habitat for fish and wildlife.
- The Fish and Wildlife Improvement Act of 1978 authorizes the Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations.

Other federal laws that could occasionally affect wildlife habitat management actions in the tract are those listed under Section 4.17.1.1 of the Wildlife section, the MLA, the Water Resources Planning Act, the Water Pollution Act, the Water Resources Development Act, the Federal Grants and Cooperative Agreements Act, the Safe Drinking Water Act, the Fish and Wildlife Act, and the Soils and Water Resources Conservation Act.

4.18.1.1.2 Design Features

The KFO RMP and other BLM and state documents provide the framework for the tract's design features, which would be reflected in lease stipulations as part of a lease contract after a ROD. DOGM, a state agency under the UDNR, would be responsible for ensuring compliance and enforcement of the lease stipulations. The following standards would be applicable to special status species and would compel mitigation for impacts to special status species related to mining the tract.

- Survey for threatened, endangered, proposed, and candidate species and their habitats. Site-specific mitigation and avoidance measures would be determined at the permitting stage.
- Avoid disturbance to individuals, populations, and habitats of threatened, endangered, proposed, and candidate species during mining.
- After mining is completed in an area, restore habitat for threatened, endangered, proposed, and candidate species in disturbed areas.
- During all operations, enforce appropriate vehicle speed limits to minimize potential for wildlife mortality.
- During all operations, instruct employees not to harass or disturb wildlife.
- Monitor reclamation sites to assess habitat reclamation success.
- Develop a practical and economic blasting plan that is sensitive to noise impacts on special status species, especially during nesting and breeding seasons.

These design features would help reduce the severity of impacts to special status wildlife species by enhancing and restoring native and suitable non-native vegetation communities in the short term and long term.

4.18.1.2 IMPACT INDICATORS

In this analysis, acres of surface disturbance in or adjacent to special status species habitats are used as the primary indicator of impacts in the tract. For noise analysis, dBA above ambient noise conditions was used as an additional indicator of impacts. For nighttime lighting analysis, lumens (a measurement of the brightness of light as perceived by the human eye) were used. Because organisms perceive light differently, it is difficult to predict how different magnitudes of lumens would affect different species. Research suggests that blue-rich white light is more detrimental to most wildlife than amber or redder light (IDA 2010). Potential impacts to special status species, such as changes in habitat quality or quantity, reduced population size, or increased mortality, are also used as impact indicators. Surface disturbance from minerals development and construction activities would occur in the tract as planned under the action alternatives.

On the reasonably foreseeable coal haul transportation route, impacts to the Utah prairie dog and its habitats adjacent to the route are analyzed as acres within a 350-foot buffer on both sides of the route. Impacts to special status species associated with riparian habitats adjacent to the reasonably foreseeable coal haul transportation route are analyzed as acres within a 100-foot buffer on both sides of the route. Impacts to all other special status species and their habitats on the reasonably foreseeable coal haul transportation route are analyzed using miles of habitat adjacent to the route. Impacts to special status species on the reasonably foreseeable coal haul transportation route are analyzed separately from impacts associated with the tract (see Section 4.18.1.5). The coal haul transportation route that is used for analysis purposes is the most reasonably foreseeable route, but it is impossible to predict the exact route that a successful bidder might choose.

As indicated in Section 3.18, special status species habitat acreages are based on detailed vegetation community surveys in the tract (SWCA 2007a), and on southwest regional land cover data (SWReGAP 2004) along the reasonably foreseeable coal haul transportation route (see Section 3.15 for a detailed description of the vegetation communities present in the tract). The vegetation communities (also referred to as habitat types) discussed for the tract and the reasonably foreseeable coal haul transportation route differ because of differences between the field surveys and SWReGAP datasets, and because different land cover types occur in these areas. Because impacts to the tract and the reasonably foreseeable coal haul transportation route are analyzed separately, land cover types are not directly compared, and differences in cover types are not a limiting factor in the analysis.

Three general categories of habitat impacts are anticipated to be the most influential on special status species and their habitats: 1) habitat fragmentation and alteration, 2) habitat loss and displacement of both individuals and populations, and 3) habitat improvements. Habitat fragmentation occurs when a contiguous habitat is broken up or fragmented by surface-disturbing activities causing a reduction in usable ranges and a disruption of movement among habitat areas. In addition, habitat fragmentation causes the isolation of less mobile species, a decline in habitat specialists, and facilitates invasion by generalist species (Marvier et al. 2004). Habitat alteration occurs when surface-disturbing activities directly or indirectly change the composition, structure, or functioning of the habitat. Habitat loss is caused by surface-disturbing activities or other activities that degrade or remove habitat. Habitat displacement occurs when land use activities force special status species to move into other habitats, thereby increasing stress on individual animals and increasing competition for habitat resources. Any surface-disturbing actions could lead to habitat alteration, fragmentation, displacement, or loss; limit the amount of usable habitat for special status species; and restrict movement among habitat areas. Habitat improvement results from maintenance, reclamation, revegetation, vegetation treatments, or other management actions that increase the quantity and/or quality of habitat conditions, or is otherwise beneficial to one or more special status species. Improvements would mostly take place with the goal of reducing juniper encroachment of sagebrush habitat.

4.18.1.3 ANALYSIS ASSUMPTIONS

The locations and habitats of some species in the tract and the reasonably foreseeable coal haul transportation route are known; however, the data are neither complete nor comprehensive for all special status species occurrences or for all potential habitats that might exist. Both known and potential special status species and habitat locations are considered in the analysis. The species and potential habitats that could be affected by various actions are assumed to be directly correlated with the degree, nature, and quantity of surface disturbance and other activities. Impacts are quantified wherever possible. In the absence of quantitative data, best professional judgment is used to analyze impacts. This analysis was prepared using the following assumptions:

- Local populations are naturally affected by nonhuman causal factors such as climate, natural predation, disease, natural fire regimes, and competition with other native species for available habitat.
- Impacts to special status species depend on the location, extent, timing, and intensity of the disturbance.
- Impacts to special status species are likely greater than impacts to species that are not special status due to the limited distribution of individuals and habitats and/or a low tolerance for disturbance.
- Ground-disturbing activities could lead to the fragmentation, alteration (positive or negative), loss, or displacement (short-term or long-term) of special status species habitats and/or loss or gain of individuals or populations.

- Disturbance occurring adjacent to special status species habitat would contribute to habitat fragmentation, alteration, and displacement due to reduced habitat quality or accessibility.
- Changes in air, water, and habitat quality may cause direct and indirect impacts to special status species and habitats, and may also have cumulative impacts on species survival.
- The existing ambient noise condition on the tract is approximately 40 dBA. Special status wildlife species would be negatively impacted by increasing ambient noise.
- Increased ambient nighttime light (measured in lumens) results in corresponding negative impacts to special status wildlife species.
- Blue-rich lighting is more detrimental to most wildlife.
- Increased ambient nighttime light is more detrimental to nocturnal wildlife.
- If mitigation, habitat maintenance, or habitat improvement actions are demonstrated to be successful, these actions could maintain or improve the condition of vegetation, soils, and other habitat conditions through vegetation treatments, restrictions on surface-disturbing activities, and site reclamation and restoration.

Impacts to stream and riparian habitats associated with the reasonably foreseeable coal haul transportation route are based on the assumption that the likelihood of a coal spill along the route would be proportional to the occurrence of one accident per year anywhere along the entire reasonably foreseeable route. It is not possible to predict future conditions that could contribute to an accident; nevertheless, the chance of an accident occurring near stream or riparian habitats, which make up a very small portion of the route, would be extremely low.

In addition to conservation and lease notices, the following would apply: species-specific recovery plans and conservation documents that include management plans and strategies to protect special status species. Applicable documents to the tract and the reasonably foreseeable coal haul transportation route include, but are not limited to the BGEPA, *the Utah Prairie Dog Recovery Plan* (USFWS and Utah Prairie Dog Recovery Team 2012), *The Utah Prairie Dog Interim Conservation Strategy* (1997), *The Northern Goshawk Conservation Agreement* (1998), *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin et al. 2002), and *Best Management Practices for Raptors and Their Associated Habitats* (BLM 2008b:Appendix 2).

4.18.1.4 IMPACTS FROM MINING THE TRACT

4.18.1.4.1 Alternative A: No Action

Under the No Action Alternative, the tract would not be mined, and no coal mining or related activities, infrastructure development, or relocation of KFO Route 116 would occur. Therefore, no acres of special status species habitat would be disturbed by these activities. However, management under the No Action Alternative would not restrict permitted mining activities on private lands adjacent to the tract. Mine-related activities would occur to a lesser degree than under the Proposed Action, Alternative C, or Alternative K1 because the total acreage of mining activities and the total duration of mining activities would be considerably less than under either of these alternatives.

Management of special status species habitats on BLM-administered lands in the tract would be conducted as directed under the KFO RMP (BLM 2008b). Under the No Action Alternative, prescribed management on BLM-administered lands would include watershed protections and improvements to special status species habitats. Vegetation management to restore sagebrush grasslands that have been invaded by pinyon-juniper woodlands would improve ecosystem functioning and watershed health. Vegetation management would have long-term, beneficial effects for upland animal species by removing undesirable vegetation, increasing species and structural diversity, and improving overall habitat quality. Pinyon-juniper tree removal would reduce the amount of foraging, roosting, and nesting habitats available to raptors, bats, and migratory birds. Vegetation treatments that would help reduce soil loss and improve water quality would likely improve aquatic and riparian habitats and benefit the special status species that rely directly or indirectly on these habitats. Erosion control measures would reduce sedimentation of water sources and associated impacts to special status amphibian species. Vegetation and soil treatments would help to reestablish upland communities, maintain or improve the health of riparian/wetland communities, reestablish seedlings and understory vegetation, and retain soil moisture and nutrients (BLM 2008b).

Table 4.18.1 lists the vegetation communities present in the tract, the special status species associated with each community, and the acres of disturbance that would occur to each community under the No Action Alternative, Proposed Action, Alternative C, and Alternative K1.

Table 4.18.1. Acreages and Direct Disturbance in the Alton Coal Tract by Vegetation Community and Associated Special Status Species Under the No Action and Action Alternatives

Vegetation Community	Associated Special Status Species[9]	Alternative A (No Action)	Alternative B (Proposed Action)			Alternative C (Reduced Tract Acreage and Seasonal Restrictions)			Alternative K1 (Reduced Tract Acreage)		
		Direct Acres Disturbed	Acres in Tract	Direct Acres Disturbed	Percentage Disturbed	Acres in Tract	Direct Acres Disturbed	Percentage Disturbed	Acres in Tract	Direct Acres Disturbed	Percentage Disturbed
Pinyon-juniper woodland	Allen's big-eared bat, Arizona toad, Ferruginous Hawk, Lewis's Woodpecker, Townsend's big-eared bat	0.0	1,430.8	694.4	48.6%	1,409.7	680.1	48.2%	1,095.1	471.6	43.1%
Sagebrush/ grassland	Burrowing Owl, Ferruginous Hawk, fringed myotis, Golden Eagle, Greater Sage-Grouse, kit fox, Long-billed Curlew, pygmy rabbit, Short-eared Owl, spotted bat, Townsend's big-eared bat	0.0	860.2	366.5	42.6%	627.8	195.7	31.2%	369.1	91.2	24.7%
Sagebrush/ grassland (treated)	Burrowing Owl, Ferruginous Hawk, fringed myotis, Golden Eagle, Greater Sage-Grouse, kit fox, Long-billed Curlew, pygmy rabbit, Short-eared Owl, spotted bat, Townsend's big-eared bat	0.0	749.1	547.5	73.1%	749.1	546.0	72.9%	289.5	235.9	81.5%
Annual and perennial grasses	Ferruginous Hawk, Long-billed Curlew, Short-eared Owl	0.0	324.1	278.4	85.9%	247.0	196.5	79.6%	247.0	196.8	79.7%
Mountain brush	Ferruginous Hawk, Lewis's Woodpecker	0.0	62.8	24.9	39.6%	62.8	24.7	39.3%	40.8	1.7	4.2%
Wetland (meadow)	Western toad	0.0	62.8	55.5	88.3%	0.0	0.0	0%	0.0	0.0	0%
Riparian	Allen's big-eared bat, Arizona toad, Bald Eagle, big free-tailed bat, Lewis's Woodpecker, Northern Goshawk, western toad	0.0	55.3	6.7	12.1%	54.0	6.3	11.7%	54.0	6.4	11.9%
Rabbitbrush	Burrowing Owl, Ferruginous Hawk, Golden Eagle, Greater Sage-Grouse, kit fox, pygmy rabbit, Short-eared Owl, spotted bat	0.0	10.7	1.0	9.2%	10.7	1.0	8.0%	10.7	1.0	9.3%
Bedrock, cliff, and canyon	Allen's big-eared bat, Black Swift, big free-tailed bat, Golden Eagle, fringed myotis, spotted bat, Townsend's big-eared bat	0.0	0.0	0.0	0%	0.0	0.0	0%	0.0	0.0	0%
Open water	Black Swift	0.0	4.1	0.0	0%	0.0	0.0	0%	0.0	0.0	0%
Habitat total		**0**	**3,559.9**	**1,974.8**	**55.5%**	**3,161.6**	**1,650.3**	**52.2%**	**2,106.2**	**1,004.6**	**47.7%**

[9] Scientific names for all wildlife and special status species can be found in Chapter 3.

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4.18.1.4.2 Impacts Common to the Action Alternatives

Under the action alternatives reasonably foreseeable mining development would occur on approximately 120 acres at any one time, with an additional approximately 120 acres or more in some stage of reclamation. Centralized facilities would be located for the life of the mine on approximately 36 acres, and dispersed facilities would be moved on a regular basis based on the mining sequence and would result in approximately 160 acres of active disturbance. This process would take place for approximately 25 years. Impacts are analyzed below based on the concept that this 120-acre mining disturbance could occur in any location throughout the tract, except for those locations prohibited in the lease conditions, and would eventually have occurred at all coal-bearing locations in the tract. Also, concurrent reclamation would take place on a rolling basis with mining, and that reclamation actions would conform to the standards listed in the lease stipulations.

Impacts to special status wildlife species common to all action alternatives would be identical to those described for wildlife (Section 4.17.4.2) except for the following.

The mining and haul truck activity on the tract and road, as well as the associated habitat removal, would lead to habitat fragmentation, especially for highly mobile species that occupy large habitat patches, such as kit fox. This fragmentation could augment typical wildlife movement patterns such as seasonal migration and daily use. Because of the presence of roads and the associated barrier effects (which reduce landscape connectivity), these species are more susceptible to reduced gene flow and a reduced regional population size. Many wildlife species are therefore at a greater risk of a reduction in the regional population size due to the presence of roads and increased traffic on existing roads. For the pygmy rabbit, large tracts of sagebrush habitat are necessary to support metapopulations and genetic mixing between the populations. For this species, habitat fragmentation and limiting genetic mixing would contribute to the further isolation of local populations.

Disturbance to or displacement of wildlife would likely occur from lighting during nighttime operations. Artificial night lighting affects animal foraging behavior, reproduction, movement, and species interactions (such as predator-prey, pollinator-plant, and competition relationships) (Beier 2006; Longcore et al. 2005, 2004; Miller 2006). Bats respond to increased nighttime light by reducing or shifting their periods of activity, traveling shorter distances, and consuming less food (Longcore and Rich 2005) (discussed in more detail in section 4.17.4.2.5). Bat species are likely to be attracted to insect activity around lights and could benefit from concentrated prey. Diurnal (day-active) and nocturnal special status species could be displaced from, or attracted to, habitats affected by night lighting. However, night lighting increases the risk of predation for small, nocturnal mammals and decreases food consumption when animals reduce foraging activities to remain concealed in an artificially lit environment (Beier 2006).

Mined sites will be reclaimed into functioning sagebrush communities. From observations of other reclaimed projects in the KFO, it is expected that reclamation will be successful within approximately 20 years of completion (Petersen 2013b). During this recovery period, reclaimed sites may have lower habitat quality than fully developed vegetation communities, and would therefore be of less value to special status species, particularly those that require mature sagebrush habitats such as pygmy rabbits.

Disturbance to native habitats could also cause degradation of special status species habitats due to an increased risk of noxious weeds invasion and associated alteration of habitat composition and structure.

4.18.1.4.3 Alternative B: Proposed Action

Impacts to special status wildlife species under Alternative B: Proposed Action would be identical to those described for wildlife (Section 4.17.4.3) except for the following.

4.18.1.4.3.1 Pygmy Rabbit

Threats to the pygmy rabbit are primarily from habitat loss across its limited range in the Inter-mountain West (Crowther 2013). In Utah, the pygmy rabbit occurs in the west half of the state, primarily in the Bonneville Basin (Crowther 2013). Similar to the Greater Sage-Grouse, this species is largely dependent on sagebrush for both food and cover. Approximately 914 acres (57%) of suitable potential habitat for pygmy rabbit, including sagebrush/grassland and sagebrush/grassland (treated) vegetation communities, would be removed under the Proposed Action (see Table 4.18.1). These impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time. If pre-construction surveys find pygmy rabbits are present on the tract, direct impacts to individuals would occur during surface disturbance. Pygmy rabbits have small home ranges. Like most burrowing mammals, they retreat into their burrows for protection from disturbance. Because of this, it is more likely that they would be crushed or buried in their burrows during mining activities than for them to leave and be displaced. If pygmy rabbits successfully flee the area, they would be displaced from these habitat resources until reclamation and successful restoration have been completed. Because pygmy rabbit presence is closely tied with the availability of soil types in which they can establish burrows, it is unknown whether the conditions of successful reclamation would provide habitat for the species' return to the tract. It is possible that the soils would be too compact to provide burrowing habitat. However, because reclamation actions would target the restoration of sagebrush habitat, as described in Section 4.18.2.1.2.1 (Sage-grouse, lease stipulations), if pygmy rabbits are able to recolonize the reclaimed areas, they would benefit from the increase availability of sagebrush habitat in the long term. If the soil conditions of the reclaimed areas prevent the return of the species, the population would not return to the habitat of the tract. The loss of this local population would reduce the health of surrounding populations by decreasing accessible genetic diversity.

Pygmy rabbit populations are typically limited by sufficient burrowing sites, so displaced individuals may not find an appropriate recolonization site outside of the actively mined area. If displaced individuals are able to disperse, they would benefit from the vegetation treatments required by the sage-grouse mitigation plan (see Appendix E), because the treatments could create more habitat for the species through the increased availability of large and connected sagebrush habitat (if the soils were appropriate for burrow colonization, as described above). The Proposed Action would result in greater short-term and long-term direct adverse impacts to pygmy rabbit and its habitats than would occur under the No Action Alternative.

4.18.1.4.3.2 Kit Fox

The kit fox is widely distributed in Utah, but may be declining (UDWR 2005). Its distribution in the tract analysis area is not known. Habitat loss, displacement by competitors, and indiscriminant predator poisoning are the primary threats to the species (Crowther 2013). Indirect impacts can result from reduced abundance of small mammal prey due to habitat alteration. Approximately 914 acres (57%) of kit fox sagebrush/grassland and sagebrush/grassland (treated) vegetation communities would be removed under the Proposed Action (see Table 4.18.1), which equates to approximately one third (34%) the size of one kit fox home range, as described in Section 3.18.2.3. In addition to direct impacts to individuals that may occur during surface disturbance and mining, kit fox would be displaced due to the removal of its habitat until reclamation and successful restoration have been completed. Because a large portion of the tract would be disturbed during surface mining and associated activities, the Proposed Action would result in greater short-term direct adverse impacts to kit fox and its habitats than would occur under the No Action Alternative. Individuals would benefit from the vegetation treatments required by the sage-grouse mitigation plan (see Appendix E) through the creation of additional sagebrush habitat in the analysis area. They would also benefit from the predator control efforts required by the sage-grouse mitigation plan, because they would reduce competition for food and other resources from red fox. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

4.18.1.4.3.3 Bat Species

Most of the vegetation communities in the tract are used as foraging habitat by one or more special status bat species (see Table 4.18.1). Potential bat roosting habitats occur adjacent to the tract. Adverse impacts to Allen's big-eared bat, big free-tailed bat, fringed myotis, spotted bat, and Townsend's big-eared bat would include the direct loss of foraging habitat in the tract; potential displacement from roosting and foraging habitats adjacent to the tract due to increased noise, human presence, and surface-disturbing activities; and habitat fragmentation and alteration. Decreased productivity of individuals or populations could result from the loss of, or displacement from, foraging habitats in or adjacent to the tract. Night lighting could disrupt roost emergence timing, predator avoidance, and foraging behaviors (Briggs 2004; Navarra et al. 2007). The potential impacts from artificial lighting are described in more detail in the following paragraph. The bedrock, cliff, or canyon vegetation community does not occur in the tract, but several small areas of this community are adjacent to the tract's eastern boundary. However, indirect impacts to these vegetation communities from subsidence would be unlikely because underground mining operations would only occur in the northeast corner of the tract. Because a large portion of the tract would be disturbed during surface mining and associated activities, the Proposed Action would result in greater short-term adverse impacts to bat species and their habitats than would occur under the No Action Alternative.

Various species of bat often forage for food in areas that are artificially lighted. Generally, this is because many species of insects are attracted to light. Bats' foraging can benefit from artificial light sources because of the high concentration of insects found at these light sources. However, bats' foraging can also be negatively impacted by artificial light sources, such as creating a greater risk of bats being exposed to predators, decreasing the prey base through insect mortality, and shifting natural insect prey to items that are easily caught at light sources (Rydell 2006). Some bats, such as the spotted bat (*Euderma maculatum*), do not forage in artificially lighted areas and are rarely seen in illuminated areas. Thus, artificial lighting also creates an imbalanced competition between bats that forage in artificial lighting and bats that avoid artificial lighting as well as intense competition at the light source (Longcore et al. 2004; Rydell 2006) (Longcore and Rich 2004; Rydell 2006). When bats' roosting sites are exposed to artificial lighting, it can delay bats' evening emergence time, shortening their feeding time. Roosts exposed to artificial lighting can also experience decreases in colony size and can lead to desertion of the roost (Patriarca et al. 2010).

Increased artificial light can also draw insects away from water, where they are normally encountered, which requires bats to make separate flights to drink. In general, drinking is a highly energetic process for bats; it consists of ingesting one drop of water with each pass over flat water or licking smaller drops (decreased in size and number with length of commute) off their fur upon returning to the safety of a roost. Artificial lighting can also concentrate prey far away from roosts and nurseries. Increased time and energy cost of longer distance commutes between nursery and insect swarms could lead to decreased nursing frequency and milk production, which could reduce the overall health of the individual, leading to a decreased resistance to communicable diseases (such as white-nose fungus).

4.18.1.4.3.4 Raptor Species

The Proposed Action would result in direct adverse impacts to foraging and wintering habitats, and active and inactive nest sites of sensitive raptor species using the tract. Raptor species are sensitive to human disturbance (Romin et al. 2002). Disturbance from mining activities or human presence near an active nest during breeding season could result in nest abandonment and/or mortality of young from increased vulnerability to predators, or reduced food intake due to avoidance of the nest site by adult raptors. Raptor species would be directly impacted by habitat loss from pit disturbance and construction activities, and by the long-term loss of wooded foraging habitats (e.g., riparian, pinyon-juniper woodland, and mountain brush vegetation communities). They would also be impacted by the removal of perch and roost sites on- and off-tract, as required by the sage-grouse mitigation plan (see Appendix E). Construction of roadways and mine-related traffic could result in increased mortality from vehicle strikes. There is an increased risk of direct mortality of ground-nesting raptor species, particularly the Burrowing Owl, from pit development and construction equipment, which could crush or bury adults, nestlings, or eggs in burrows; however, this species is not currently known to breed on the tract. Impacts to active nesting sites would be mitigated by raptor nest surveys and avoidance measures. However, if a nest area is disturbed outside of the nesting season, there is a likelihood that the raptor would not return to the nest the following nesting season. Raptors forage in all habitat types, and the loss of foraging habitats due to direct disturbance or removal would result in the displacement of raptors from these areas until habitats have been successfully restored. Suitable raptor nesting sites would likely be reduced by the removal of 694 acres of pinyon-juniper woodland. No bedrock, cliff, or canyon roosting and nesting habitat occurs in the tract, but several small habitat areas are adjacent to the tract's eastern boundary. However, indirect impacts to these habitat areas from subsidence would be unlikely because underground mining operations would occur in the northeast corner of the tract. Because a large portion of the tract would be disturbed during surface mining and associated activities, the Proposed Action would result in greater short-term adverse impacts to raptor species and their habitats than would occur under the No Action Alternative. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

Special lease stipulations and BMPs would minimize adverse impacts to raptor species, especially during the breeding season, by providing spatial and seasonal buffers of both occupied and unoccupied nests. Additionally, mitigation actions aimed at reducing corvid species in the area (as required by the sage-grouse mitigation plan; see Appendix E) would reduce competition for nesting sites for some raptor species, and would reduce the potential for predation of raptor eggs by corvids.

4.18.1.4.3.5 Migratory Bird Species

The Proposed Action would result in direct adverse impacts to the Black Swift, Lewis' Woodpecker, Long-billed Curlew, and Three-toed Woodpecker breeding, nesting, and wintering habitats. Loss of habitat due to removal of vegetation and surface disturbance and associated activities would reduce foraging and nesting habitats, cover, and roosting and nesting sites. Most surface disturbance under the Proposed Action would occur in sagebrush/grassland and sagebrush/grassland (treated) (914 acres) and pinyon-juniper woodland vegetation communities (694 acres). Therefore, Long-billed Curlew and Lewis's Woodpecker habitats, respectively associated with these vegetation communities, would be most greatly affected. Habitat fragmentation, alteration, displacement, and loss for ground-nesting species would result from pit disturbance and construction activities. These species would be at increased risk of direct mortality from excavation and construction due to potential for crushing or burial of adults, nestlings, and eggs on the ground. Increased mine-related traffic could also result in increased mortality from vehicle strikes. Impacts to active nesting sites would be mitigated by nest surveys and avoidance measures. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

The loss of foraging habitats due to direct disturbance or removal would result in the displacement of special status bird species from these areas until habitats have been successfully restored. Woodpecker nesting habitat in the tract would be reduced by the removal of 49% of pinyon-juniper woodland vegetation communities in the tract. Because of the large portion of the tract that would be disturbed during surface-mining and associated activities, the Proposed Action would result in greater short-term adverse impacts to special status bird species and their habitats than would occur under the No Action Alternative. Special lease stipulations and BMPs would minimize adverse impacts, especially during the breeding season, by requiring surveys for and avoidance of nest sites.

Table 4.18.2. Acreages and Direct Disturbance in the Alton Coal Tract by Vegetation Community and Associated Sensitive Species Under the Action Alternatives

Vegetation Community	Associated Sensitive Species	Alternative B (Proposed Action)			Alternative C (Reduced Tract Acreage and Seasonal Restrictions)			Alternative K1 (Reduced Tract Acreage)		
		Acres in Tract	Acres Disturbed	Percentage Disturbed	Acres in Tract	Acres Disturbed	Percentage Disturbed	Acres in Tract	Acres Disturbed	Percentage Disturbed
Pinyon-juniper woodlands	Allen's big-eared bat, Arizona toad, Ferruginous Hawk, Lewis's Woodpecker, Townsend's big-eared bat	1,430.8	694.4	48.6%	1,410.2	680.1	48.2%	1,095.1	471.6	43.1%
Sagebrush/ grassland	Burrowing Owl, Ferruginous Hawk, fringed myotis, Golden Eagle, Greater Sage-Grouse, kit fox, Long-billed Curlew, pygmy rabbit, Short-eared Owl, spotted bat, Townsend's big-eared bat	860.2	366.5	42.6%	627.8	195.7	31.2%	369.1	91.2	24.7%
Sagebrush/ grassland (treated)	Burrowing Owl, Ferruginous Hawk, fringed myotis, Golden Eagle, Greater Sage-Grouse, kit fox, Long-billed Curlew, pygmy rabbit, Short-eared Owl, spotted bat, Townsend's big-eared bat	749.1	547.5	73%	749.1	546.1	73%	289.5	235.9	77%
Annual and perennial grasses	Ferruginous Hawk, Long-billed Curlew, Short-eared Owl	324.1	278.4	85.9%	247.0	196.5	76.6%	247.0	196.8	79.7%
Mountain brush	Ferruginous Hawk, Lewis's Woodpecker	62.8	24.9	39.6%	62.8	24.7	39.3%	40.8	1.7	4.2%
Wetland (meadow)	Western toad	62.8	55.5	88.3%	0.0	0.0	0%	0.0	0.0	0%
Riparian	Allen's big-eared bat, Arizona toad, Bald Eagle, big free-tailed bat, Lewis's Woodpecker, Northern Goshawk, western toad	55.3	6.7	12.1%	54.0	6.3	11.7%	54.0	6.4	11.9%
Rabbitbrush	Burrowing Owl, Ferruginous Hawk, Golden Eagle, Greater Sage-Grouse, kit fox, pygmy rabbit, Short-eared Owl, spotted bat	10.7	1.0	9.2%	10.7	1.0	8.0%	10.7	1.0	9.3%
Total		**3,555.8**	**1,974.8**	**55.5%**	**3,161.6**	**1,650.3**	**52.2%**	**2,106.2**	**1,004.6**	**47.7%**

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4.18.1.4.3.6 Amphibian Species

Impacts to amphibian species from mining are identical to those described for common amphibian species (Section 4.17.4.3.4). Potential habitats for the Arizona toad in pinyon-juniper woodlands near water comprise up to approximately 1,431 acres of the tract. Under the Proposed Action, 49% (694 acres) of the pinyon-juniper woodland vegetation community would be directly disturbed by mining and associated activities (see Table 4.18.1). Because reclamation actions would be directed toward establishing a post-mining sagebrush community, the habitat used by this species would be permanently lost, and displaced individuals would not return to the tract. This displacement, in combination with the limited distribution of the species, could impact the abundance of the local population.

Potential habitats for the western toad in wetland (meadow) and riparian vegetation communities comprise approximately 118 acres (3%) of the tract. Under the Proposed Action, approximately 53% (63 acres) of wetland and riparian habitats would be removed by mining and associated activities (see Table 4.18.1). As stated in Section 3.18, the BLM's *Riparian Management Policy* (IM UT-2005-091) would be followed, which would limit riparian habitat removal on the tract. Compliance with this IM would help to minimize impacts on individuals of this species, and ensure that entire populations are not impacted. Because a portion of the tract would be disturbed during surface mining and associated activities, the Proposed Action would result in greater short-term adverse impacts to amphibian habitats than would occur under the No Action Alternative. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

4.18.1.4.4 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Under Alternative C, the nature of impacts would be the same as under the Proposed Action, but would differ in the acres of disturbance and timing of mine-related activities. Impacts on special status wildlife species under Alternative C would be identical to those described for wildlife (Section 4.17.4.4) except for the following.

Under Alternative C, the nature of impacts to special status species occurring in the tract analysis area would be the same as described for the Proposed Action and under the Impacts Common to the Action Alternatives section. Noise and nighttime light impacts would be the same as those described in section 4.17.5.2 and under the Proposed Action, except that they would occur on 331 fewer acres and for a shorter duration of 21 years (the mine life under this alternative). Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

4.18.1.4.4.1 Pygmy Rabbit

Approximately 742 acres (54%) of potential suitable habitat for pygmy rabbit, including sagebrush/grassland and sagebrush/grassland (treated) vegetation communities, in the tract would be removed under Alternative C (see Table 4.18.1). In addition to direct impacts that may occur during surface disturbance and mining if it found to occur on the tract, the pygmy rabbit would be temporarily displaced from these habitat resources. However, it is unknown whether successful reclamation would be able to recreate soil conditions necessary for pygmy rabbit burrowing, so the displacement may be permanent. Alternative C would result in greater short-term adverse impacts to the pygmy rabbit and its habitat than would occur under the No Action Alternative.

4.18.1.4.4.2 Kit Fox

Approximately 742 acres (54%) of suitable habitat for kit fox, including sagebrush/grassland and sagebrush/grassland (treated) vegetation communities, would be removed under Alternative C (see Table 4.18.1), which equates to less than one third (27%) the size of one kit fox home range, as described in Section 3.18.2.3. In addition to direct impacts that may occur during surface disturbance and mining, the kit fox would be displaced from these habitat resources until reclamation and successful restoration have been completed. Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to the kit fox and its habitats than would occur under the No Action Alternative.

4.18.1.4.4.3 Bat Species

Under Alternative C, impacts to Allen's big-eared bat, big free-tailed bat, fringed myotis, spotted bat, and Townsend's big-eared bat would include the loss of suitable roosting and foraging habitat; displacement from suitable habitat due to increased noise, human presence, and surface-disturbing activities; and habitat fragmentation and alteration (see Table 4.18.1). Impacts due to night lighting and 24-hour mine operations would be reduced by timing restrictions on mining in Block S. No bedrock, cliff, or canyon roosting vegetation community occurs in the tract, but several small areas of this community are adjacent to the tract's eastern boundary. However, indirect impacts to these areas from subsidence would be unlikely because underground mining operations would only occur in the northeast corner of the tract. Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to bat species and their suitable habitats than would occur under the No Action Alternative.

4.18.1.4.4.4 Raptor Species

Alternative C would result in direct adverse impacts to foraging and wintering habitats, and active and inactive nest sites of sensitive raptor species using the tract due to loss of suitable habitat from pit disturbance and construction activities, and by the long-term loss of wooded foraging habitats (e.g., riparian, pinyon-juniper woodland, and mountain brush vegetation communities). The nature of impacts to raptor species would be the same as described for the Proposed Action. The increased risk of direct mortality of ground-nesting raptor species from pit development and construction equipment would be reduced by the elimination of the Block NW and by timing stipulations in Block S. Suitable raptor nesting sites would likely be reduced by the removal of 680 acres of pinyon-juniper woodland. Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to raptor species and their suitable habitats than would occur under No Action. As under the Proposed Action, special lease stipulations and BMPs would minimize adverse impacts to raptor species, especially during the breeding season, by providing spatial and seasonal buffers of both occupied and unoccupied nests.

4.18.1.4.4.5 Migratory Bird Species

Under Alternative C, Black Swift, Lewis' Woodpecker, Long-billed Curlew, and Three-toed Woodpecker suitable foraging and nesting habitats, cover, and suitable roosting and nesting sites would be directly impacted by surface disturbance and associated activities. The nature of impacts to these bird species would be the same as described for the Proposed Action. Most surface disturbance under Alternative C would occur in sagebrush/grassland and sagebrush/grassland (treated) (742 acres) and pinyon-juniper woodland vegetation communities (680 acres). Long-billed Curlew and Lewis's Woodpecker habitats, respectively associated with these vegetation communities, would be most greatly affected. Ground-nesting and foraging species would be directly impacted by pit disturbance and construction activities, and would be at increased risk of direct mortality from excavation and construction due to potential for crushing or burial of adults, nestlings, and eggs on the ground. Increased mine-related traffic could result in increased mortality from vehicle strikes. Impacts to active nesting sites would be mitigated by nest surveys and avoidance measures. The loss of suitable foraging habitats due to direct disturbance or removal would result in the displacement of special status bird species from these areas until suitable habitats have been successfully restored. Woodpecker suitable nesting habitat would be reduced by the removal of 680 acres of pinyon-juniper woodland. Because of the large portion of the tract that would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to special status bird species and their suitable habitats than would occur under the No Action Alternative. Special lease stipulations and BMPs would minimize adverse impacts, especially during the breeding season, by requiring surveys for and avoidance of nesting sites.

4.18.1.4.4.6 Amphibian Species

Impacts to amphibian species from mining activities include habitat fragmentation and loss, displacement to lower quality habitats, increased exposure to predators from cover removal, crushing and burial of adults and young, and attraction to ecological 'traps' such as water holding ponds. The nature of impacts to amphibian species would be the same as described for the Proposed Action. The Arizona toad's pinyon-juniper woodland vegetation community makes up 1,410 acres in the tract under Alternative C. Under this alternative, 48% (680 acres) of pinyon-juniper woodland would be directly disturbed by mining and associated activities (see Table 4.18.1). None of the western toad's wetland (meadow) vegetation community would be directly disturbed under Alternative C. However, approximately 6 acres of the western toad's riparian vegetation community would be disturbed under this alternative. Because a portion of the tract would be disturbed during surface mining and associated activities, Alternative C would result in greater short-term adverse impacts to amphibian species' vegetation communities than would occur under the No Action Alternative. Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

4.18.1.4.5 Alternative K1: Reduced Tract Acreage

Under Alternative K1, the nature of impacts would be the same as under the Proposed Action, Alternative C, and Impacts Common to the Action Alternatives, but they would differ in the acres of disturbance, or magnitude. Impacts to special status wildlife species under Alternative K1 would be identical to those described for wildlife (Section 4.17.4.5) except for the following. Noise and nighttime light impacts would be the same as those described in Section 4.17.4.2 and under the Proposed Action, except that they would occur on 981 fewer acres and for a shorter duration of 16 years (the life of the mine under this alternative). Impacts are reported in terms of total acres of disturbance over the life of the mine, but note that this disturbance would not all occur at one time.

4.18.1.4.5.1 Pygmy Rabbit

Approximately 327 acres (50%) of potential suitable habitat for pygmy rabbit, including sagebrush/grassland and sagebrush/grassland (treated) vegetation communities, in the tract would be removed under Alternative K1 (see Table 4.18.1). In addition to direct impacts that may occur during surface disturbance and mining if the pygmy rabbit is found on the tract, the pygmy rabbit would be temporarily displaced from these habitat resources. However, it is unknown whether successful reclamation would be able to recreate soil conditions necessary for pygmy rabbit burrowing, so the displacement may be permanent. Alternative K1 would result in greater short-term adverse impacts to the pygmy rabbit and its suitable habitat than would occur under the No Action Alternative.

4.18.1.4.5.2 Kit Fox

Approximately 327 acres (50%) of suitable habitat for kit fox, including sagebrush/grassland and sagebrush/grassland (treated) vegetation communities, would be removed under Alternative K1 (see Table 4.18.1), which equates to approximately one tenth (12%) of the size of one kit fox home range, as described in Section 3.18.2.3. In addition to direct impacts that may occur during surface disturbance and mining, the kit fox would be displaced from these habitat resources until reclamation and successful restoration have been completed. Impacts to vegetation communities would be reduced by the exclusion of Block NW and Block S from mining activities. Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to the kit fox and its suitable habitats than would occur under the No Action Alternative.

4.18.1.4.5.3 Bat Species

Under Alternative K1, impacts to Allen's big-eared bat, big free-tailed bat, fringed myotis, spotted bat, and Townsend's big-eared bat would include the loss of suitable roosting and foraging habitat; displacement from suitable habitat due to increased noise, human presence, and surface-disturbing activities; and habitat fragmentation and alteration (see Table 4.18.1). Impacts to suitable habitat would be reduced by the exclusion of Block NW and Block S from mining activities. No bedrock, cliff, or canyon roosting vegetation community occurs in the tract, but several small areas of this community are adjacent to the tract's eastern boundary. However, indirect impacts to these areas from subsidence would be unlikely because underground mining operations would only occur in the northeast corner of the tract. Because a large portion of the tract would be disturbed during surface mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to bat species and their suitable habitats than would occur under the No Action Alternative.

4.18.1.4.5.4 Raptor Species

Alternative K1 would result in direct adverse impacts to 1) raptor foraging and wintering habitats and 2) active and inactive nest sites of sensitive raptor species using the tract from loss of suitable habitat from pit disturbance and construction activities. This alternative would also result in the long-term loss of wooded foraging habitats (e.g., riparian, pinyon-juniper woodland, and mountain brush vegetation communities). The nature of impacts to raptor species would be the same as those described for the Proposed Action. The increased risk of direct mortality of ground-nesting raptor species from pit development and construction equipment would be reduced by the exclusion of Block NW and Block S from mining activities. Suitable raptor nesting sites would likely be reduced by the removal of 472 acres (43%) of pinyon-juniper woodland. Because a large portion of the tract would be disturbed during surface-mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to raptor species and their suitable habitats than would occur under the No Action. As under the Proposed Action and Alternative C, special lease stipulations and BMPs would minimize adverse impacts to raptor species, especially during the breeding season, by providing spatial and seasonal buffers of both occupied and unoccupied nests.

4.18.1.4.5.5 Migratory Bird Species

Under Alternative K1, Black Swift, Lewis' Woodpecker, Long-billed Curlew, and Three-toed Woodpecker suitable foraging and nesting habitats, cover, and suitable roosting and nesting sites would be directly impacted by surface disturbance and associated activities. The nature of impacts to these bird species would be the same as described for the Proposed Action and Alternative C. Most surface disturbance under Alternative K1 would occur in sagebrush/grassland and sagebrush/grassland (treated) (327 acres) and pinyon-juniper woodland vegetation communities (472 acres). Long-billed Curlew and Lewis's Woodpecker habitats, respectively associated with these vegetation communities, would be most greatly affected. Ground-nesting and foraging species would be directly impacted by pit disturbance and construction activities, and would be at increased risk of direct mortality from excavation and construction due to potential for crushing or burial of adults, nestlings, and eggs on the ground. Increased mine-related traffic could result in increased mortality from vehicle strikes. Impacts to active nesting sites would be mitigated by nest surveys and avoidance measures. The loss of foraging habitats due to direct disturbance or removal would result in the displacement of special status bird species from these areas until suitable habitats have been successfully restored. Woodpecker nesting habitat would be reduced by the removal of 472 acres of suitable nesting habitat, including pinyon-juniper woodland. Because of the large portion of the tract that would be disturbed during surface-mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to special status bird species and their suitable habitats than would occur under the No Action Alternative. Special lease stipulations and BMPs would minimize adverse impacts, especially during the breeding season, by requiring surveys for and avoidance of nesting sites.

4.18.1.4.5.6 Amphibian Species

Impacts to amphibian species from mining activities include habitat fragmentation and loss, displacement to lower quality habitats, increased exposure to predators from cover removal, crushing and burial of adults and young, and attraction to ecological 'traps' such as water holding ponds. The nature of impacts to amphibian species would be the same as described for the Proposed Action and Alternative C. The Arizona toad's pinyon-juniper woodland vegetation community makes up 1,095 acres in the tract under Alternative K1. Under this alternative, 43% (472 acres) of pinyon-juniper woodland would be directly disturbed by mining and associated activities (see Table 4.18.1). None of the western toad's wetland (meadow) vegetation community would be directly disturbed under Alternative K1. However, approximately 6.4 acres of the western toad's riparian vegetation community would be disturbed under this alternative. Because a portion of the tract would be disturbed during surface-mining and associated activities, Alternative K1 would result in greater short-term adverse impacts to amphibian species' vegetation communities than would occur under the No Action Alternative.

4.18.1.5 IMPACTS FROM COAL HAULING

There would be no additional loss of special status species habitat from the reasonably foreseeable coal haul transportation route. Coal transportation would occur on existing roads and would not necessitate road upgrades. Impacts to special status species are identical to those described for wildlife (Section 4.17.5) except for the following analysis, which focuses on direct and indirect impacts to special status species from increased rates of traffic.

4.18.1.5.1 Alternative A: No Action

Wildlife mortalities along US-89, SR-20, I-15, and SR-56 are likely to increase due to additions of mine-related traffic from existing fee coal mine areas adjacent to the tract that would use existing routes (see Section 4.19). A large portion of the reasonably foreseeable coal haul transportation route would be adjacent to special status species habitats (Table 4.18.3). From 2003 to 2005, wildlife-related single-vehicle crashes made up 51% of crashes on US-89, 18% of crashes on US-20, 11% of crashes on I-15, and 41% of crashes on SR-56 (Fehr & Peers Transportation Consultants 2013). Wildlife mortality and associated disruptions in habitat use would be expected to occur under both the No Action Alternative and the action alternatives. However, mine-related traffic and associated wildlife impacts would be minimized under the No Action Alternative due to the expected lower volume of truck traffic.

Table 4.18.3. Land Cover Miles Adjacent to the Reasonably Foreseeable Coal Haul Transportation Route and Associated Special Status Wildlife Species Under the No Action and Action Alternatives

Cover Type	Associated Special Status Animal Species	Miles	Percentage of Route
Sagebrush	Burrowing Owl, Ferruginous Hawk, fringed myotis, Golden Eagle, Greater Sage-Grouse, kit fox, pygmy rabbit, Short-eared Owl, spotted bat, Townsend's big-eared bat	49.4	43.1%
Developed	None	41.6	36.3%
Pinyon-juniper woodland	Allen's big-eared bat, Arizona toad, Ferruginous Hawk, Lewis's Woodpecker, Townsend's big-eared bat	11.7	10.2%
Agriculture	Ferruginous Hawk, Long-billed Curlew, Short-eared Owl	7.3	6.4%
Shrub-steppe	Burrowing Owl, Ferruginous Hawk, Golden Eagle, Greater Sage-Grouse, kit fox, Long-billed Curlew, pygmy rabbit, Short-eared Owl, spotted bat, Townsend's big-eared bat, Utah prairie dog	0.2	0.2%

Table 4.18.3. Land Cover Miles Adjacent to the Reasonably Foreseeable Coal Haul Transportation Route and Associated Special Status Wildlife Species Under the No Action and Action Alternatives

Cover Type	Associated Special Status Animal Species	Miles	Percentage of Route
Woodland-shrubland	Black Swift, elk, Ferruginous Hawk, Lewis's Woodpecker, Three-toed Woodpecker	2.2	1.9%
Bedrock, cliff, and canyon	California Condor, Allen's big-eared bat, black swift, big free-tailed bat, fringed myotis, spotted bat, Townsend's big-eared bat	1.1	1.0%
Grassland (native and invasive grasses/forbs)	Burrowing Owl, elk, Ferruginous Hawk, fringed myotis, Long-billed Curlew, Short-eared Owl, Utah prairie dog	0.2	0.2%
Open water	Black Swift, Bonneville cutthroat trout	< 0.1	< 0.1%
Salt desert scrub	Big free-tailed bat, Burrowing Owl, Ferruginous Hawk, Golden Eagle, kit fox, long-billed Curlew, Short-eared Owl, spotted bat	< 0.1	< 0.1%
Riparian	Allen's big-eared bat, Arizona toad, Bald Eagle, big free-tailed bat, Lewis's Woodpecker, Northern Goshawk, Western toad	0.8 40.8 acres*	0.7%
	Total	**114.7 miles**	**100.0%**

Notes: Scientific nomenclature for all wildlife species in this EIS is introduced in Chapter 3.

Acres of riparian habitat within 100-feet of the reasonably foreseeable coal haul transportation route are also included to assess potential impacts in the unlikely event of a coal truck accident in close proximity to this cover type.

Land cover miles are the same for all three action alternatives because the reasonably foreseeable coal haul transportation route is the same for all alternatives.

* The analysis area for riparian also includes acres of habitat within a 100-foot buffer of the reasonably foreseeable coal haul transportation route.

4.18.1.5.2 Alternative B (Proposed Action), Alternative C (Reduced Tract Acreage and Seasonal Restrictions), and Alternative K1 (Reduced Tract Acreage)

Impacts to special status species under the Proposed Action, Alternative C, and Alternative K1 are identical to those described for wildlife (Section 4.17.5.2) with the following exceptions.

Any increase in roadkill could increase raptor activity along the reasonably foreseeable coal haul transportation route, which could result in increased predation on sage-grouse, pygmy rabbit, or other special status animals occupying habitats adjacent to the route.

4.18.1.5.2.1 Pygmy Rabbit

Impacts to the pygmy rabbit along the reasonably foreseeable coal haul transportation route would consist of increased loss of individuals from vehicle collisions and from increased predator abundance along roadways, which is a likely result of increased traffic-related roadkills. Increased traffic would also increase road barrier effects, thereby increasing fragmentation in and among populations. Suitable habitat for this species (sagebrush and shrub-steppe) occurs adjacent to approximately 50 miles (43%) of the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to the pygmy rabbit and its habitats would likely be greater than would occur under the No Action Alternative.

4.18.1.5.2.2 Utah Prairie-dog

There is limited information on road-related impacts to the prairie-dog and other small mammals. Impacts associated with increased vehicle traffic likely include greater loss of individuals from vehicle collisions and from increased predator abundance along roadways, a likely result of increased traffic-related roadkills. It is not known if traffic noise interferes with predator warning calls or with other communication in prairie-dog colonies. Utah prairie-dog habitats occur adjacent to 28.3 miles (26%) of the reasonably foreseeable coal haul transportation route (UDWR GIS data updated May 2007). The USFWS has established a 350-foot buffer as the range within which normal behavior of individual Utah prairie dogs may be disrupted by noise or human presence. Known Utah prairie dog colonies occur within 350 feet of the reasonably foreseeable coal haul transportation route on 673 acres. These colonies are estimated to contain 1,768[10] prairie dogs, or approximately 24.4% of the total estimated Utah prairie dog population (Crowther 2013). Under the Proposed Action, Alternative C, and Alternative K1, traffic and noise-related adverse impacts to the Utah prairie-dog and its habitats would likely be greater than would occur under the No Action Alternative.

4.18.1.5.2.3 Kit Fox

Impacts to the kit fox from increased vehicle traffic would likely include loss of individuals from vehicle collisions. Kit fox sagebrush, shrub-steppe, and salt desert scrub habitats occur adjacent to approximately 50 miles (43%) of the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Impacts associated with an increase in vehicle traffic would likely include an increased loss of individuals from vehicle collisions, particularly due to increased nighttime traffic when the species is active. Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to the kit fox and its habitats would likely be greater than would occur under the No Action Alternative.

4.18.1.5.2.4 Bat Species

Potential foraging and roosting bat habitats occur adjacent to the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Traffic-related impacts to Allen’s big-eared bat, big free-tailed bat, fringed myotis, spotted bat, and Townsend’s big-eared bat would likely consist of displacement from habitat due to 1) increased noise and 2) disruption of roosting or foraging behaviors in habitats adjacent to the route resulting from an increase in nighttime vehicle traffic. Special status bat habitats in sagebrush, pinyon-juniper woodland, shrub-steppe, grassland, salt desert scrub, cliff and canyon, and riparian cover types occur adjacent to approximately 63 miles (55%) of the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Riparian habitats occur on 40.8 acres within a 100-foot buffer of the reasonably foreseeable coal haul transportation route. Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to bat species and their habitats would likely be greater than would occur under the No Action Alternative.

4.18.1.5.2.5 Raptor Species

Increased coal truck traffic would likely result in direct adverse impacts to bald eagle, burrowing owl, California condor, ferruginous hawk, golden eagle, northern goshawk, and short-eared owl from vehicle strikes. The increase in traffic volume would likely result in increased roadkills, which would attract raptor species to the reasonably foreseeable coal haul transportation route and increase the likelihood of raptor mortality from vehicle collisions. Raptor foraging and nesting habitats in sagebrush, pinyon-juniper woodland, agriculture, shrub-steppe, woodland-shrubland, grassland, salt desert scrub, and riparian cover types occur adjacent to approximately 72 miles (62%) of the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Additionally, there is a possibility that as the California condor population increases, individual birds could migrate into the area of mining and coal-hauling activities and be attracted to the increased roadkill, resulting in mortality from vehicle collisions. Potential habitats for the northern goshawk occur in 40.8 acres of riparian habitat within 100 feet of the reasonably foreseeable coal haul transportation route. These

[10] Many prairie dog colonies straddle the buffer, with portions inside and portions outside. Thus, it is impossible to know how many individuals in these colonies are inside or outside the buffer. For the purpose of this analysis, it is assumed that all individuals in the colonies that straddle the buffer are within the buffer area.

riparian habitats contain two known occupied goshawk habitat areas (UDWR 2010). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to raptor species would likely be greater than would occur under the No Action Alternative.

4.18.1.5.2.6 Migratory Bird Species

Increased coal truck traffic would likely result in limited adverse impacts to the Black Swift, Lewis' Woodpecker, Long-billed Curlew, and Three-toed Woodpecker and their habitats. Nevertheless, increased traffic volume could result in increased mortality from vehicle strikes. Foraging and nesting habitats for special status bird species in agriculture, shrub-steppe, woodland-shrubland, cliff and canyon, grassland and salt desert scrub cover types occur adjacent to approximately 11 miles (10%) of the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to these bird species would likely be greater than would occur under the No Action Alternative.

4.18.1.5.2.7 Amphibian Species

Increased coal truck traffic would likely result in limited adverse impacts to the Arizona toad and western toad along the reasonably foreseeable coal haul transportation route. Nevertheless, increased traffic volume could result in increased mortality from vehicle strikes. Amphibian habitat in pinyon-juniper woodlands occur adjacent to approximately 12 miles (10%) of the reasonably foreseeable coal haul transportation route (see Table 4.18.3). Under the Proposed Action, Alternative C, and Alternative K1, transportation-related adverse impacts to amphibians would likely be slightly greater than would occur under the No Action Alternative.

4.18.1.5.2.8 Fish Species

The Bonneville cutthroat trout is known to occur in Threemile Creek, which would be intersected by the reasonably foreseeable coal haul transportation route. Due to the expected increase in the volume of coal truck traffic associated with mining operations, there is increased potential for accidental coal spills to stream habitats along the reasonably foreseeable coal haul transportation route. Approximately 0.8 mile (0.7%) of the reasonably foreseeable coal haul transportation route transects stream habitats where there is the potential for a coal truck spill into the waterway. Stream and riparian habitats occur on 40.8 acres of riparian habitat within 100 feet of the reasonably foreseeable coal haul transportation route. Although the risk of a spill to this small portion of the route is negligible, the introduction of coal, petroleum products, or other hazardous materials from a coal truck spill could directly or indirectly adversely impact Bonneville cutthroat trout and their habitats by causing mortality of individual fish or prey species from poisoning, or from loss of habitat due to reduced water quality or other habitat features.

4.18.2 Greater Sage-Grouse

4.18.2.1 REGULATORY FRAMEWORK AND ADDITIONAL DESIGN FEATURES

4.18.2.1.1 Regulatory Framework

Numerous federal and state regulations shape the management of Greater Sage-Grouse. Regulations that pertain specifically to sage-grouse include the following:

- The Washington Office IM 2012-043 (BLM 2011b) identifies the need to "cumulatively maintain or enhance sage-grouse habitat." The IM also provides interim conservation policies and procedures to BLM field officials to be applied to ongoing and proposed authorizations and activities that affect the sage-grouse and its habitat. Under this IM, the BLM has the authority to condition the lease with a requirement for off-site mitigation (refer to IM 2008-204, Off-Site Mitigation; BLM 2008g).

- In Utah, UDWR biologists are managing sage-grouse populations per the sage-grouse conservation plan (UDWR 2013). The sage-grouse conservation plan reflects sage-grouse recommendations that were provided to the Governor of Utah by a multidisciplinary group of stakeholders in early 2012. Sage-grouse seasonal habitats and use designations associated with the plan are reported in the SDEIS because they are used for management by UDWR and are considered the best available data except where more site-specific information is available.
- The BLM is currently revising land use plans for field offices statewide to ensure proper protection of sage-grouse populations. Land use plan revisions are being conducted to prevent the listing of Greater Sage-Grouse as a threatened or endangered species under the ESA. The land use planning process is ongoing and will not be completed until approximately the end of 2014. One of the alternatives included in the analysis (Alternative E) is the sage-grouse conservation plan (UDWR 2013), discussed below. See Section 1.7.1.1 for a detailed description of this process and its effect on the decision to lease the tract.
- All federal lands must be screened to determine which are acceptable for further consideration for coal leasing. One screening procedure requires the BLM to apply 20 unsuitability criteria (as listed in 43 CFR 3461.5) to each LBA tract to determine if the area being considered for leasing is suitable for surface mining or surface effects from underground mining. Unsuitability Criterion 15 states that the following shall be considered unsuitable for surface mining or surface effects from underground mining: federal lands that the surface management agency and the state jointly agree are habitat for resident species of fish, wildlife, and plant species also of high interest to the state and that are essential for maintaining these high-interest species, such as active dancing and strutting grounds (lek) for sage-grouse. The sage-grouse mitigation plan (see Appendix E) is intended to address Unsuitability Criterion 15 to ensure that sage-grouse, as a high-interest species, is maintained.
- Although not a regulatory document, the *Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report* (USFWS 2013a) includes specific information on the Panguitch population of grouse.

As described in Section 1.7.1.2.2 (Application of Unsuitability Criteria), four decisions in the KFO RMP (BLM 2008b) pertain to sage-grouse management (SSS-54, SSS-55, SSS-56, and SSS-57) and detail temporal and spatial buffers for leks and winter habitat within which no surface-disturbing activity may occur. SSS-57 states that an exemption, waiver, or modification may be granted for each RMP decision on a case-by-case basis[11]. As a result of decisions SSS-54, SSS-55, and SSS-56, a decision to lease would not be in conformance with the KFO RMP. However, for the purpose of analysis in this EIS, it is assumed that an exception, modification, or waiver would be granted in the event of a lease per decision SSS-57. Appendix 3 of the KFO RMP describes the mechanisms by which exceptions, waivers, or modifications would occur (Table 1.7.1). In the ROD following this EIS, it remains within the BLM's decision space not to except, waive, or modify the RMP decisions based on the analyses conducted.

[11] The BLM Field Manager is responsible for approving any exception, modification, or waiver. For SSS-54, the operator must submit a plan that demonstrates that impacts from the proposed action can be adequately mitigated. For SSS-54, the Field Manager may modify the boundaries of the stipulation area if (1) portions of the area do not include lek sites, (2) the lek site(s) have been completely abandoned or destroyed, or (3) occupied lek site(s) occur outside the current defined area, as determined by the BLM. For SSS-54, the Field Manager may grant a waiver if there are no active lek site(s) in the leasehold and it is determined the site(s) have been completely abandoned or destroyed or occur outside current defined area, as determined by the BLM. For SSS-55 and SSS-56, the operator must submit a plan that demonstrates that impacts from the proposed action can be avoided, sufficiently minimized, or adequately mitigated for an exception to be granted. For SSS-55 and SSS-56, the Field Manager may modify the boundaries of the stipulation area if portions of the area do not include habitat or are outside the current defined area, as determined by the BLM. For SSS-55 and SSS-56, the Field Manager may grant a waiver if it is determined the habitat no longer exists or has been destroyed. There is no formal public input into these decisions.

4.18.2.1.2 Design Features

The KFO RMP and other BLM and state documents provide the framework for the tract's design features, which would be reflected in lease stipulations as part of a lease contract after a ROD. DOGM, a state agency under UDNR, would be responsible for ensuring compliance and enforcement of the lease stipulations. The standards described in the sage-grouse mitigation plan (see Section 4.18.2.1.2.3 and Appendix E) would also be applicable as design features and would compel mitigation for impacts to wildlife related to mining the tract.

This section first provides a summary of the results anticipated from the successful completion of all design features. This is provided up front to give the reader a holistic view of the way the design features would ultimately work together to cumulatively maintain and enhance the amount and quality of sage-grouse habitat available in the analysis area. Following the summary, individual design features are listed and described in detail. They are broken into four distinct categories: 1) *pre-mining vegetation treatments*, or the treatment of areas on the tract to decrease conifer encroachment and increase the quality of the vegetation as Greater Sage-Grouse habitat; 2) *on-tract mitigation*, or required avoidance and minimization measures; 3) *reclamation*, or the restoration of habitat disturbed during mining operations to pre-mining conditions; and 4) *off-tract mitigation*, or requirements to take place off the tract as detailed in the sage-grouse mitigation plan. The off-tract mitigation measures are described in the larger context of the sage-grouse mitigation plan (see Appendix E). Note that exact reclamation standards and the success of completed reclamation actions are determined under SMCRA with the oversight of DOGM under a separate permitting process.

4.18.2.1.2.1 Anticipated Results from Enforcement of Pre-mining Vegetation Treatment, Reclamation, and On- and Off-tract Mitigation Measures

The required pre-mining vegetation treatment, reclamation, and mitigation measures detailed below and listed in the design features, as well as in the sage-grouse mitigation plan comply with the IM 2012-043 requirement to "cumulatively maintain and enhance Greater Sage-Grouse habitat" by instituting the following requirements:

- Habitat avoidance through the designation of limited-touch areas in sagebrush habitats in the tract
- Conducting vegetation treatment on Block Sa (comprising 186.3 acres) to reduce conifer encroachment before mining activities start
- Requiring that Blocks S and NW not be mined simultaneously, allowing one to provide a refuge while the other is experiencing disturbances due to mining
- Reclaiming in-tract sagebrush habitats to vegetation standards that would provide sage-grouse habitat in the long term
- 4:1 ratio of disturbance to off-tract mitigation acres to increase available habitat in the analysis area in the short term
- Prioritizing off-tract vegetation treatments in areas where conifer removal can be done from an intact sagebrush understory in locations immediately adjacent to habitat occupied by sage-grouse, such as those areas analyzed in the BLM's *South Canyon Vegetation Enhancement Project Environmental Assessment* (BLM 2010c) and Upper *Kanab Creek Watershed Improvement Project Environmental Assessment* (BLM 2011d), as shown in Map 3.23.
- Requiring that off-tract vegetation treatment mitigation projects intended to comply with the 4:1 mitigation ratio are completed no more than one year after the corresponding on-tract surface disturbance occurs.

The anticipated results from the combined pre-mining vegetation treatment, reclamation, and mitigation actions are based on observations from previously conducted telemetry observations, reclamation projects, and vegetation treatments in the KFO, as described in Section 3.18.3. These observations indicate the following:

1. Sage-grouse would occupy vegetation treatment areas, consisting of juniper removal from an intact sagebrush understory (both on- and off-tract), shortly after the vegetation treatment, and in many cases within the following year (Frey 2013; Frey et al. 2013a), especially when the treated areas are adjacent to already occupied habitat. Use by sage-grouse of previously completed vegetation treatment area is described in detail in Section 3.18.3.4.2.
2. An analysis of habitat use from telemetry data collected from 2005 to 2009 documented birds using both Blocks NW and S year-round (Frey et al. 2013b), indicating that Block NW could serve as a refuge while mining activities are conducted on Block S, and vice versa.
3. Successfully reclaimed areas would function as sage-grouse habitat within approximately 15–20 years from the date of completion (Petersen 2013b).
4. Off-tract vegetation treatments would enhance habitat availability and connectivity in the long term, thereby contributing to the genetic resilience of the population.

It is anticipated that sage-grouse would continue to use the limited-touch areas of the tract, Block Sa, and habitat adjacent to but outside of the tract while mining takes place. Pre-mining vegetation treatment of Block Sa would create an initial increase in available habitat. Because sage-grouse currently use the habitat of both Blocks NW and S year-round, it is anticipated that Block NW would serve as a refuge and be used by grouse year-round while portions of Block S are experiencing mine-related disturbances, and vice versa. As the vegetation in reclaimed areas becomes established and begins to resemble sage-grouse habitat, individuals are expected to use these parcels. Successful reclamation would represent an increase in available habitat for the species in the long term because many of these areas are currently degraded and underused by sage-grouse due to juniper encroachment. And finally, the requirement for off-site vegetation treatments at a ratio of 4 acres for every 1 acre disturbed would increase available habitat for the Panguitch population as a whole, as well as increase connectivity and genetic flow among the population breeding groups. The requirement that the off-site projects are completed no more than one year following the corresponding disturbance in combination with the initial increase in available habitat from treating Block Sa would ensure that the amount of available habitat is maintained throughout the life of the mine.

Compliance with these requirements would ensure there would be no net loss of habitat for Greater Sage-Grouse, and would lead to a net increase of available habitat for the population as a whole in both the short and long term. Many of the locations that would be enhanced, reclaimed, and treated may not otherwise be completed without the funding made available by mining activities. In the long term, the enhanced habitats of the tract, mined areas reclaimed to sagebrush, and increased availability of habitat population-wide would further BLM’s objectives of maintaining and enhancing habitat for Greater Sage-Grouse, and would thereby aid in the stabilization or increase of the Panguitch population. The ability to increase habitat availability and connectivity between breeding groups would increase the health and resiliency of the group breeding near the tract, as well as increase the capacity for the population as a whole to increase.

Success of the on- and off-tract vegetation treatments would not be dependent on whether sage-grouse are documented using the treated habitat. Use is not required for two reasons:

1. It is highly likely that treatments would be successful because of the requirement (as listed above) to prioritize off-tract vegetation treatments in areas where conifer removal can be done from an intact sagebrush understory in locations immediately adjacent to habitat occupied by sage-grouse, such as those areas analyzed in the BLM's *South Canyon Vegetation Enhancement Project Environmental Assessment* (BLM 2010) and *Upper Kanab Creek Watershed Improvement Project Environmental Assessment* (BLM 2011). Vegetation treatments meeting this requirement are highly likely to quickly increase the availability of sage-grouse habitat (Baruch-Mordo et al. 2013; Commons et al. 1999).
2. Unpredictable environmental events, such as extreme drought or very harsh winter conditions, may preclude grouse individuals from using certain habitat, even if it meets all biological needs. It is unreasonable to hold the selected lessee to a success criterion that may be out of its control.

4.18.2.1.2.2 Detailed Project Design Features

This section summarizes the required sage-grouse–related mitigation, pre-mining vegetation treament, and reclamation actions listed in Table 2.6.1 of this document and in the sage-grouse mitigation plan (see Appendix E). These actions would be required under all action alternatives except where not applicable based on the tract configuration under any given alternative (e.g., Alternative K1 excludes Blocks S and Sa). The anticipated impacts of completing these actions are included in the impacts analysis below. All of the actions listed are intended to address the need for sage-grouse to have refugia (or an area of suitable habitat to which sage-grouse individuals can retreat when other habitats have been disturbed) available during mining activities. Compliance with these actions would lead to the desired results as summarized above.

Pre-mining Vegetation Treatment

- In coordination with BLM and DOGM, conduct vegetation treatments on sage-grouse nesting, brood-rearing, and wintering habitat on public lands in Block Sa (see Map 1.2) and on the limited-touch areas of Block S where treatments have not already been accomplished (described below) before any mine-related ground disturbance takes place. Treatment would consist of actions to reduce conifer encroachment in areas with established sagebrush understories. The particulars of these habitat improvements would be contingent upon the results of pre-disturbance vegetation surveys and an analysis of data.

In the short term (life of the mine), pre-mining vegetation treatments in Blocks S and Sa would improve conditions for sage-grouse by removing overstory pinyon and juniper (due to encroachment), establishing native and desirable non-native grasses and forbs, and allowing the existing sagebrush canopy cover to increase. This would improve the structural and compositional diversity of sage-grouse habitat compared to current conditions (BLM 2008b) in areas currently occupied year-round by sage-grouse (Frey et al. 2013b). Vegetation treatment activities in Block Sa before mining starts would ensure that the net balance of occupied sage-grouse habitat would remain positive and a refuge area would be created. Conifer removal treatments would quickly create sage-grouse refugia in the short term. Sage-grouse have been documented using Block Sa year-round (Map 3.26); therefore, it is likely they would continue to use this habitat and possibly increase use in Block Sa after treatments are completed (Frey et al. 2013b; Frey 2008).

On-tract Mitigation

- To the extent possible, avoid disturbance to individuals, populations, and habitats of threatened, endangered, proposed, and candidate species during mining.
- Monitor grouse populations (currently within the Alton area) throughout the year to assess bird survival, nest site and nest success, brood-rearing sites, and key winter habitat areas.

- Avoid using intact sagebrush stands for storing mining-generated spoil and topsoil stockpiles. Where practicable, these spoil and topsoil stockpile sites would avoid nesting habitat. Coal-processing equipment would be located in areas that create the least possible disturbance to sage-grouse and sage-grouse habitat.
- Conduct mosquito abatement in holding ponds and standing water to reduce the potential for transmission of West Nile virus to sage-grouse.
- Designate limited-touch areas in sagebrush habitats in the tract. The term limited-touch area is used in this document to describe no-coal areas within the tract that have intact or restored sagebrush habitats that are required to provide adequate refugia throughout the life of the mine (see Map 3.24). Surface-disturbing activities in these limited-touch areas would be avoided if possible. However, these areas could be used to access mining blocks that would otherwise be inaccessible. Limited-touch areas would be enforced, which would incorporate the following conditions:
    - Surface-disturbing activities in portions of the tract in the no-coal zone (e.g., intact, native sagebrush stands in Block S of the tract) would be prohibited.
    - Mine-related surface-disturbing activities would be prohibited in portions of the tract in the no-coal zone where on-site vegetation treatment actions would be required by special lease stipulations (e.g., Block Sa of the tract).
    - New surface-disturbing activities in Blocks S or NW of the tract would be temporarily prohibited until successful reclamation (as determined on a case-by-case basis by DOGM) has occurred on an equal area of a previously disturbed portion of the tract in either of these blocks (i.e., planning the mining sequence so that Block S or NW is reclaimed and provides functioning sage-grouse habitat prior to initiating new surface-disturbing activities on the other block).
- Do not mine Blocks NW and S at the same time; mining would likely begin in Block S (although the exact mining sequence is not known at this time). Because Sage-grouse currently use both blocks year-round, this would allow Block NW to serve as a refugia during Block S mining operations. Avoidance of the enhanced sagebrush habitats in Block Sa would be required to provide adequate refugia throughout the life of the mine.
- Apply the following short- and medium-term mitigation measures on Block S (and other locations in the tract as appropriate) to enhance habitat for Greater Sage-Grouse:
    - Avoid sagebrush stands in no-coal zones as habitat to the extent practicable and economically feasible.
    - Locate centralized facilities (i.e., office, maintenance shop, equipment wash bay, oil and fuel storage tanks, oil and fuel storage containment, truck unloading and coal sizing area, coal stockpile area, and truck loadout area) and dispersed facilities (i.e., temporary light-use roads and haul roads, electrical poles and lines, various temporary ponds and water-control structures, temporary topsoil and overburden stockpiles, and temporary berms and screens) to create the least possible practical and economic disturbance to sage-grouse and sage-grouse habitat.

The reclamation and off-site vegetation treatment actions described in this section that would take place concurrently with mining would be designed to improve habitat conditions for sage-grouse in the long term. However, retention of the Alton sage-grouse population would require that year-round, suitable habitats are continuously available to provide refugia while removal and restoration of other habitat areas are taking place. This would require the avoidance of 1) intact sagebrush stands and other seasonal sage-grouse habitats, such as the agricultural and wet meadow habitats in Block NW that are used year-round; and 2) sagebrush nesting, and brood-rearing habitats (limited-touch areas) in Block S. It would also require that vegetation treatment in Block Sa is completed before mining starts so birds in the adjacent habitats of Block S would have habitat in which to move.

Tract Reclamation

- Remove juniper and pinyon seedlings found in reclaimed areas until full release of the reclamation bond.
- Conduct post-reclamation surveys for undesirable/invasive plant species on biannual basis (spring and fall).
- Begin vegetation monitoring in the next growing season after fall seeding/planting and monitor until reclamation goals are achieved.
- Monitor reclamation sites until bond release to assess habitat reclamation success.
- As practical and economically feasible, reclaim to AOC and seed with similar plant species and composition to approximate pre-mining, original community on Block S.
- On Block S (and other locations in the tract as appropriate), apply the following long-term habitat reclamation measures to enhance habitat for Greater Sage-Grouse:
    - Reclaim to create range sites based on approved ecological site descriptions (conditions for the growth of grasses, forbs, and sagebrush).
    - Plant bare root or potted sagebrush and bitterbrush in identified sites to accelerate shrub reestablishment.
    - Seed and plant in the fall.

Exact reclamation standards and the success of completed reclamation actions are determined under SMCRA with the oversight of DOGM under a separate permitting process. The habitat reclamation and restoration activities that would follow mining disturbance would be designed to create habitat for the Greater Sage-Grouse and ensure that year-round habitat is available for use during mining activities. Successful habitat reclamation would require that restored sagebrush communities achieve maturity and the structural diversity required to support Greater Sage-Grouse. In the BLM's experience with vegetation treatments completed locally, development of a mature sagebrush community requires approximately 15–20 years (personal communication, Petersen 2013). On the tract, sagebrush communities would presumably require a similar time period to recover on reclaimed soils. Recovery time would depend on numerous ecological variables such as local topography, soil reclamation success, soil type, variations in local and regional climate, colonization of the site by soil-building fungi and bacteria, and other site features that cannot be predicted or easily quantified. The reclamation plan to plant sagebrush seedlings would be designed to accelerate sagebrush reestablishment and to accelerate the successional development of mature sagebrush communities.

Over the long term, reclamation of disturbed areas and successful restoration of diverse sagebrush habitat on the tract would contribute to the creation of contiguous sagebrush vegetation necessary for the long-term persistence of the Alton sage-grouse population. The analysis presented here assumes that habitat reclamation actions would be successful, and that these actions would lead to the establishment of self-sustaining and self-propagating mature sagebrush communities. Mitigation and pre-mining vegetation treatment projects would create habitat in the short term.

4.18.2.1.2.3 Off-Tract Mitigation: Greater Sage-Grouse Mitigation Plan

The BLM initiated a stakeholder process to develop a mitigation plan to describe the strategy for avoiding and reducing impacts, where possible, to sage-grouse potentially affected by leasing and mining the tract and by identifying on- and off-site mitigation opportunities. The Color Country Adaptive Resource Management Local Working Group (CoCARM)—the local sage-grouse working group—comprises agency and government officials with knowledge of the current land uses and quality of habitat in the local area needed to develop an effective and appropriate mitigation plan that identifies on- and off-site potential mitigation projects and locations. This group includes members that represent the UDWR, BLM, USFS, USFWS, DOGM, affected private landowners, and local public officials. As such, this group was identified as a representative stakeholder group for initial discussions about off-site mitigation.

The requirements of the sage-grouse mitigation plan would be applicable to all action alternatives except where the configuration of the action alternative makes certain requirements of the plan unnecessary. If the BLM's decision following the EIS process is to offer the tract for competitive leasing, the requirements of the mitigation plan would be incorporated as design features appropriate to the alternative selected. The mitigation plan can be found in Appendix E.

All mitigation activities would be conducted in the mitigation plan area, which corresponds to the analysis area used for sage-grouse in this document (see Map 3.21) (State of Utah 2013). The mitigation plan/analysis area includes public, state, and private land. The mitigation plan was developed in response to concerns expressed by the public and agencies through the comments submitted on the DEIS. The mitigation plan is also a result of the regulatory framework listed in Section 4.18.2.1.1.

The goals of the mitigation plan are summarized as follows:

- Offset habitat impacts of mining to sage-grouse habitat within the tract, as identified through the EIS process, by implementing habitat management and off-tract vegetation treatment projects in the analysis area.
- Identify opportunities that mitigate for impacts to the Panguitch population from threats under the five listing factors used by the USFWS to assess the status of ESA-listed and candidate species. A detailed discussion of these factors can be found in Endangered and Threatened Wildlife and Plants; 12-month Findings for Petitions to List the Greater Sage-Grouse (Centrocercus urophasianus) as Threatened or Endangered; Proposed Rule (50 CFR 17, *Federal Register* 75:13910–14014).
- Identify mitigation projects based on the availability of existing site-specific sage-grouse population information (e.g., lek counts and telemetry locations) and ecological condition information (e.g., habitat location and size, opportunity locations, and completed vegetation treatment locations), including data gathered for the adjacent Coal Hollow Mine, which has been in operation since 2010.

Off-tract Mitigation Requirements

Off-tract mitigation requirements refer to vegetation treatment and mitigation actions that would be required on lands off the tract but in the analysis area. The following off-tract mitigation requirements are also described in detail in the sage-grouse mitigation plan:

- Vegetation treatments (including water availability/riparian habitat improvement projects) at a ratio of 4:1 per acre of directly disturbed sage-grouse habitat. Research pertaining to and concurrent with the vegetation treatments (e.g., telemetry or other survey type to document grouse habitat use, sagebrush canopy measurements) is necessary to ensure appropriate and successful treatments.
- The marking or removal of all fences that occur within 2 miles of an active lek.
- Because coal trucks comprise approximately 4% of the traffic on nearby roads, the proponent would be responsible for funding up to 4% of the UDOT's roadkill carcass removal on the coal transportation haul route in coordination with UDOT, DOGM, UDWR, and BLM. Enforcement would be based on a cooperative agreement between these entities.
- A nearby mine approximately half the size of the tract has contracted with USDA Wildlife Services to spend approximately $6,000 every five years for local predator control. Under this lease agreement, the selected lessee will provide $12,000[12] (ACD 2009)every five years to UDSA Wildlife Services to fund predator control actions in the mitigation plan area (analysis area), focusing on corvid species, red fox, and other potential predators.

[12] This amount is based on a doubling of the amount that ACD has contracted with USDA Wildlife Services to spend on predator control from 2011 to 2016 as partial mitigation fulfillment for the Coal Hollow permit (see Appendix B of Appendix 3-5 of the MRP [ACD 2009]).

The exact acres of required vegetation treatments would be based on the UDWR occupied habitat polygon (99% of the tract), but would also incorporate the most accurate and recent site-specific habitat information. The selected lessee would not be required to mitigate for disturbance of nonhabitat. As a result of the vegetation treatment ratio, between 3,656 and 7,258 acres of the analysis area would be enhanced for Greater Sage-Grouse use. The exact amount of treated habitat would depend on the alternative chosen for implementation and the amount of nonhabitat occurring on the tract. Off-site vegetation treatments would be completed no more than one year after the corresponding on-tract surface disturbance occurs. The exact timing of mitigation projects would be determined at the permitting stage, when more detailed knowledge of the mining sequence and level of disturbance are known.

Off-tract vegetation treatments to fulfill mitigation requirements would be prioritized in areas where conifer removal could be done from an intact sagebrush understory in locations immediately adjacent to habitat occupied by sage-grouse, such as those areas analyzed in the BLM's *South Canyon Vegetation Enhancement Project Environmental Assessment* (BLM 2010) and *Upper Kanab Creek Watershed Improvement Project Environmental Assessment* (BLM 2011), as shown in Map 3.23. Due to inadequate funding, without mining vegetation treatment, projects in these areas would likely be completed over the course of decades. With funding from the selected lessee, projects in these areas could be conducted within a short timeframe and make a large amount of habitat available to local sage-grouse within the timeframe of the life of the mine (which varies under each alternative). Areas covered by these environmental assessments could undergo vegetation treatments immediately, without having to delay the mitigation process for additional analysis and/or permitting.

Exact reclamation standards and the success of completed reclamation actions are determined under SMCRA with the oversight of DOGM under a separate permitting process. For the purpose of this analysis, lands that have been disturbed by mining and reclaimed to the standards listed in the lease stipulations would not be considered as mitigation, and so would not contribute to the tally of mitigated acres required by the 4:1 ratio. As described above, reclamation would be done with the intent of creating sagebrush habitat in the long term. Mitigation projects would create habitat in the short term.

4.18.2.2 IMPACT INDICATORS

Impact indicators for Greater Sage-Grouse are identical to those described for all other special status species (Section 4.18.1.2).

4.18.2.3 ANALYSIS ASSUMPTIONS

Analysis assumptions for Greater Sage-Grouse are identical to those listed for all special status wildlife species in Section 4.18.1.3, with the following additions. To analyze and disclose the effects to Greater Sage-Grouse from coal mining associated with the Proposed Action, Alternative C, and Alternative K1, it is assumed that 1) mining would occur and that there would be an exemption, waiver, or modification of the KFO RMP surface stipulations SSS-54, SSS-55, and SSS 55 regarding Greater Sage-Grouse (BLM 2008b), and that 2) surface disturbance would be allowed within a 0.5-mile radius of a Greater Sage-Grouse lek and within a 2.0-mile radius of a Greater Sage-Grouse lek in occupied habitat from March 15 to July 15. Without an exemption, waiver, or modification to surface stipulations, mining would not be permitted on most of the tract.

The regulatory authorities and responsibilities of this lease are described in detail in Section 1.5 of this document. The permits, actions, and plans required for mining to occur on the tract are listed in Table 1.5.1. This is important to note because leasing—the decision to be made by this document—is done at a programmatic scale. Detailed knowledge regarding the exact timing and sequence of mining is not developed until the permitting stage, and it will be subject to approval by BLM and DOGM. For this analysis, it is assumed that additional site-specific measures regarding 1) avoidance of sage-grouse, 2) on- and off-tract vegetation treatments for sage-grouse, 3) mitigation for sage-grouse, and 4) and reclamation for sage-grouse would be developed during the permitting stage once more detailed operations information is known. A mining plan with specific details about mining methods, sequence, and mitigation would be available for review by cooperating agencies and the public at the permitting stage. The lease stipulations listed above would apply to the lease unconditionally.

4.18.2.4 IMPACTS FROM MINING THE TRACT

The nature of impacts common to all action alternatives would be identical to those described for wildlife (Section 4.17.4.2) and special status species (Section 4.18.1.4.2). The following sections highlight impacts specific to Greater Sage-Grouse under each alternative. The elements of disturbance would be the same as those described for special status species (Section 4.18.1.4.2).

4.18.2.4.1 Alternative A: No Action

Impacts to Greater Sage-Grouse from the No Action Alternative would be identical to those described for all other special status species (Section 4.18.1.4.1) with the following addition. The encroachment of pinyon pine and Utah juniper into sagebrush habitats, and the lack of contiguous sagebrush habitats for nesting, brood-rearing, and wintering sage-grouse have been limiting factors in the size and distribution of the Alton sage-grouse population in the past. Tree removal and seeding to restore sagebrush habitats on 1,700 acres in the Alton–Sink Valley by the BLM in 2005 resulted in increased forb and grass cover and increased use of the treated areas by sage-grouse (Curtis et al. 2007). Ongoing management to improve the distribution, abundance, and connectivity of suitable habitats would have beneficial impacts on the species.

4.18.2.4.2 Alternative B: Proposed Action

Impacts to Greater Sage-Grouse under the Proposed Action would be identical to those described for all other special status species (Section 4.18.1.4.3) except what is described in the following sections.

4.18.2.4.2.1 Habitat Loss and Displacement

The Proposed Action would result in more direct adverse impacts to the Alton sage-grouse population and currently occupied habitat than would occur under the No Action Alternative. Implementation of the Proposed Action would result in the disturbance of approximately 1,992 more acres (56% of the tract and 0.7% of the analysis area over the life of the mine) of occupied sage-grouse habitat than would occur under the No Action Alternative. *Occupied* habitat denotes habitat that may be used throughout the year, although not all habitat is used year-round. Habitat types that would be removed include breeding, brood rearing, and wintering. According to locally collected telemetry data (Frey et al. 2013), impacts from the Proposed Action would result in disturbance to 1,503.8 acres of breeding habitat (21.8% of available habitat and 42.3% of the tract), 1,723.2 acres of brood-rearing habitat (19.5% of available habitat and 48.5% of the tract), 1,416.3 acres of late season brood-rearing habitat (38.8% of available habitat and 39.9% of the tract), and 1,490.0 acres of wintering habitat (37.4% of available habitat and 42.0% of the tract). Note that these habitat types overlap and do not add to a comprehensive total. Impacts are reported in terms of total acres of disturbance over the life of the mine, but it should also be noted that this disturbance would not all occur at one time.

As described in Section 1.7.1.2.2 (Application of Unsuitability Criteria), four decisions in KFO RMP (BLM 2008b) pertain to sage-grouse management (SSS-54, SSS-55, SSS-56, and SSS-57), and detail temporal and spatial buffers for leks and winter habitat within which no surface-disturbing activity may occur. SSS-57 states that an exemption, waiver, or modification may be granted for each RMP decision on a case-by-case basis. For the purpose of analysis in this EIS, it is assumed that an exception, modification, or waiver would be granted in the event of a lease per decision SSS-57. An exception, modification, or waiver of these decisions would eliminate no surface occupancy protections within 0.5-

mile of sage-grouse leks, allow surface-disturbing activities within 2 miles of sage-grouse leks from March 15 to July 15, and allow surface-disturbing activities within sage-grouse wintering habitat from December 1 to March 14. Eliminating these protections could result in the short- or long-term displacement or loss of the local birds. Despite the requirements of the lease stipulations, suitable habitats may not be adequately available to prevent the loss or displacement of the existing breeding and wintering group(s). If displacement occurs, it is unknown whether the grouse would return to the area in the long term, following reclamation. The long-term beneficial impacts from the vegetation treatments required by the lease stipulations are contingent upon the local sage-grouse breeding and wintering group(s) having persisted in the area.

Reclamation actions would include seeding sagebrush and planting seedlings to accelerate the successional development of suitable sage-grouse habitat. Over the long term, these reclamation measures would improve the overall quality of habitat areas that are degraded prior to mining. The sage-grouse mitigation plan was developed to address potential impacts to sage-grouse (see Section 4.18.2.1.2.3 and Appendix E). The sage-grouse mitigation plan would be included as a special lease stipulation if the tract is leased. This plan would maintain short-term habitat losses through the requirements of the lease stipulations, and ultimately create four times the habitat disturbed in the analysis area.

The Alton sage-grouse population is isolated by its distribution at the southern portion of the species' range and the limited distribution of nesting, brood-rearing, and wintering habitats in the area. Under the Proposed Action, the sage-grouse occupying the Alton–Sink Valley area would be adversely affected where surface disturbance associated with coal mining and construction activities occur in the species' habitats. As described in Section 4.17.1.2, reclamation measures would be required to restore Greater Sage-Grouse nesting, brooding, and wintering habitats. Pre-mining vegetation treatment actions in Block Sa (i.e., eliminating juniper, planting grass, forb, and sagebrush seedlings) would also be required to minimize loss of existing sagebrush habitat in the short term. Reclamation actions would create new sagebrush habitats in the long term, which according to BLM's local experience with habitat treatments on undisturbed soils, reclamation could require approximately 20 years (personal communication, Petersen 2013); however, the exact timing would depend on site and environmental conditions (see Section 4.17.3). In the long term, reclamation and vegetation treatment actions throughout the tract would create sagebrush stands of varying ages and structure, and would increase the overall quality and quantity of habitats available to the sage-grouse breeding in the Alton area.

Some anecdotal observations suggest the sage-grouse breeding in the Alton–Sink Valley area are unusually tolerant of human disturbance (Curtis et al. 2007; Frey 2009), which indicates that the population may be able to tolerate some level of indirect disturbance associated with mining and reclamation. As described in Chapter 3, the Alton–Sink Valley birds have been observed on the Coal Hollow parcel inside the active mining pit, flying over active mining equipment, and occupying roadsides (Personal Communication, Petersen 2013). The presence of sage-grouse in the active mining area suggests that birds may be somewhat tolerant of human disturbance, and may not be completely displaced if mining commences on the tract. However, the birds' continued use of the area does not prove that the levels of human disturbance are not adversely affecting annual mortality rates or fecundity. Also, as indicated by Frey's telemetry information, these birds are assumed to be a nonmigratory population. Thus, the continued use of the area may just be a result of the birds having nowhere else to go.

A sage-grouse mitigation plan was developed for this project and would require that off-site mitigation actions take place off the tract but in the analysis area concurrent with mining operations (see Appendix E and Section 4.18.2.1.2.3). Off-site mitigation actions include vegetation treatments at a ratio of 4:1 acres of direct disturbance, marking or removal of all fences within 2 miles of an active lek, funding a portion of UDOT's carcass removal program on the transportation route, and providing contributions to predator control actions. The BLM's South Canyon Vegetation Enhancement Project and the Upper Kanab Creek Watershed Improvement Project have analyzed and approved 121,327 and 51,600 acres, respectively, of vegetation for treatments to take place over the next 10–15 years within the sage-grouse analysis area, and mitigation-related vegetation treatments would be prioritized in these areas—especially in areas adjacent to habitat occupied by sage-grouse. Under the Proposed Action, approximately 7,258 acres of habitat off-tract would be enhanced for sage-grouse use through vegetation treatments. Off-site vegetation treatments would be completed no more than one year after the corresponding on-tract surface disturbance occurs. The exact timing of mitigation projects would be determined at the permitting stage, when more detailed knowledge of the mining sequence and level of disturbance are known. These mitigation actions would lessen impacts of mining operations on the sage-grouse population by providing additional and alternate habitat for use, reducing the potential for collisions with fence lines, and controlling local populations of species that predate on sage-grouse eggs and juveniles. Actions required in the mitigation plan would apply to all action alternatives.

The development of the coal mine would eliminate nesting, brood-rearing, and wintering habitat resources adjacent to the lek complex during the life of the mine and during the subsequent restoration and recovery period. The new lek is in a limited-touch area of Block S, meaning that it would not be mined, and the avoidance measures detailed in the lease stipulations would be followed so disturbance to this habitat would be minimized as much as possible. Fragmentation, alteration, degradation, and loss of Greater Sage-Grouse habitats would occur as a result of mining activity and associated noise and human presence. Development of the coal mine, removal of overburden, and surface mining operations would result in the short-term loss of habitat resources and displacement or loss of individual birds. The mitigation, reclamation, and on- and off-tract vegetation treatment plans would be designed to enhance the long-term persistence of the sage-grouse breeding in the Alton area.

A telemetry study of movement between the Hoyt's Ranch lek and the Alton–Sink Valley lek found that the birds known to breed at the Hoyt's Ranch lek traveled to the Alton Valley during summer and fall months, indicating that they are using the Alton Valley to forage, raise their young, and winter (Petersen 2010; Frey 2010). The noise and human activity on the tract may deter grouse that breed at Hoyt's Ranch from traveling to the Alton Valley, thereby reducing connectivity between the two breeding groups. A reduction in connectivity would exclude or discourage the Hoyt's Ranch group from using the foraging, brood-rearing, and wintering habitat of Alton Valley, thereby reducing the health of the birds attending the Hoyt's Ranch lek and the overall Panguitch population.

4.18.2.4.2.2 Infrastructure Impacts, Including Roads

Infrastructure associated with mining activities, such as buildings, fences, and power lines, could cause injury or mortality from collisions and facilitate increased predation by raptors and *Corvus* species (crows and ravens) by increasing the availability of perching sites. The mitigation measure for the selected lessee to provide $12,000 every five years to fund predator control actions in the analysis area (described in Appendix E) would lessen the severity of predation on the grouse population.

Mining activities and associated surface disturbance and road development would also facilitate invasion by weed species (Bergquist et al. 2007). In addition, the creation of holding ponds would increase mosquito abundance and could increase the likelihood of West Nile virus being transmitted to local sage-grouse. In Wyoming and Oregon, West Nile virus has caused sage-grouse mortality (Naugle et al. 2004).

Any additional individual mortalities of birds that use the tract could have a substantial impact on the overall likelihood of local persistence. The lease stipulation requiring mosquito abatement in holding ponds and standing water would reduce the potential for transmission of West Nile virus to the sage-grouse population.

Construction activities near active leks during the breeding season would have direct adverse impacts to sage-grouse by disrupting courtship behaviors, decreasing nest initiation rates, decreasing nest success, and increasing the risk of mortality of sage-grouse adults and chicks from collisions with, or crushing by, vehicles and construction equipment. Recent studies indicate that sage-grouse lekking and brooding habitat is devalued within 1,300 feet of roads and other surface disturbances, which causes avoidance and displacement to other habitat areas (Connelly et al. 2000; Crawford et al. 2004; UDWR 2002). Other recent studies have found that natural gas field development within 1–3 miles of an active Greater Sage-Grouse lek can lead to dramatic declines in breeding populations, and energy development within 4 miles of a lek can decrease male attendance (Holloron 2005:638–649; Walker et al. 2007), indicating a 0.5-mile buffer around active leks may not be sufficient to avoid impacts to breeding activities. Manier et al. (2013) identified indirect impacts to sage-grouse from highways, primary, and secondary routes using a 1.9-mile buffer; however, they acknowledge that road-effect distances generally increase with increased traffic density and speed. Noise associated with human presence, mining, and associated facilities (i.e., power generators) in the tract, and coal truck traffic to and from the tract, could reduce breeding success by decreasing nest initiation and nest success in adjacent habitats. Ongoing surface disturbance and associated noise could cause the displacement of sage-grouse from crucial nesting and brood-rearing habitats in the tract. Under the Proposed Action, approximately 1,992 acres (56% of the tract and 0.7% of the analysis area over the life of the mine) of occupied habitat would be impacted through direct surface disturbance (Table 4.18.4; see Map 3.25).

Sage-grouse may avoid habitats near roads. Greater Sage-Grouse are susceptible to reduced gene flow and a reduced regional population size due the presence of roads from barrier effects (which reduce landscape connectivity). Sage-grouse are therefore at a greater risk of a regional population size reduction due to the continuing presence of existing roads, increased traffic on roads, and the relocation of KFO Route 116. The mining and haul truck activity on the tract and road, as well as the associated habitat removal, would lead to habitat fragmentation. This fragmentation could augment typical movement patterns, such as seasonal migration and daily use.

Table 4.18.4. Direct Impacts to Greater Sage-Grouse Habitats in the Tract under the No Action and Action Alternatives

	Acres in the Analysis Area	Alternative A (No Action)	Alternative B (Proposed Action)			Alternative C (Reduced Tract Acreage and Seasonal Restrictions)			Alternative K1 (Reduced Tract Acreage)		
		Acres Disturbed	**Acres in Tract**	**Acres Disturbed**	**Percentage Disturbed (Tract/Analysis Area)**	**Acres in Tract**	**Acres Disturbed**	**Percentage Disturbed (Tract/Analysis Area)**	**Acres in Tract**	**Acres Disturbed**	**Percentage Disturbed (Tract/Analysis Area)**
UDWR Occupied Habitat*	271,617	0	3,550.8	1,991.7	56.1%/0.7%	3,147.7	1,661.3	52.8%/0.6%	2,088.3	1,011.9	48.5%/0.4%

Source: UDWR (2012)

Note: This analysis assumes that all dispersed facilities would occur in sage-grouse habitat; however, the exact locations of these facilities are unknown.

* The tract habitat is designated by UDWR as brood-rearing habitat, but based on site-specific information available to date (i.e., Frey et al. 2013; Frey 2010; Curtis and Frey 2008; Petersen 2007; 2010; 2012; 2013), it is evident the species does not use the tract habitat solely for brood-rearing; therefore, throughout this document the term “occupied” is employed.

4.18.2.4.2.3 Noise and Nighttime Lighting Impacts

Acoustic communication is important to the reproductive behaviors of sage-grouse. There is evidence that the acoustic displays produced by males on leks facilitate reproduction in at least two ways. First, females use these vocalizations to find lek locations within the habitat. Second, after arrival at a lek, there is evidence that females use male vocalizations (and other aspects of male display) to choose a mate. Anthropogenic noise in sage-grouse habitat may mask vocalizations produced by males (thereby interfering both with the females' ability to locate leks and to choose mates [Upper Green River Basin Sage-Grouse Working Group 2007]), produced by females to communicate with chicks, and to warn other sage-grouse of nearby predators. Noise levels on the tract could range from as low as 48 dBA to over 80 dBA within approximately 1 km of the equipment and centralized facilities, and as high as 56 dBA from 1 km to 5 km out from the range of the equipment and centralized facilities. There would be intermittent locations of no additional noise (0 dBA) occurring at increasing frequency the further away from the equipment and processes one is located. Increases in ambient noise levels would cease out to distances greater than 5 km from equipment and processes, as discussed in the noise modeling report (see Appendix L). Therefore, when mining would take place within a 5-km radius of the Alton–Sink Valley lek complex, the active lek location(s) could experience noise levels greater than the 40-dBA baseline sound levels expected. Furthermore, Blocks S and NW (areas intended to provide refuge for grouse raising broods) would have elevated noise levels when the mining activity would take place within 5 km of each block.

Noise associated with human presence, mining, and associated facilities (e.g., power generators) in the tract, as well as coal truck traffic to and from the tract, could reduce breeding success by decreasing nest initiation and nest success in adjacent habitats. Ongoing surface disturbance and associated noise could cause the displacement of sage-grouse from occupied habitats in the tract, including on Blocks S and NW, and may interfere with auditory cues important to mate selection and may interfere with predator detection.

The nature of the impacts from nighttime lighting on sage-grouse would be the same as that described for all other special status species (Section 4.18.1.4). Although it is unclear exactly to what degree, sage-grouse individuals using the tract would be negatively impacted by artificial nighttime lighting associated with mining activities. Because mining would occur on 120 acres at any one time, these impacts would decrease with distance from the mining operations.

4.18.2.4.3 Alternative C: Reduced Tract Acreage and Seasonal Restrictions

Under Alternative C, the nature of impacts would be the same as under the Proposed Action, but would differ in the acres of disturbance and timing of mine-related activities. Impacts to Greater Sage-Grouse from Alternative C would be identical to those described for all other special status wildlife species (Section 4.18.1.4) except for the following.

Timing restrictions would be in place for Block S to reduce impacts to the Greater Sage-Grouse that use the tract habitat (see Section 2.4.2.3 Sage-grouse Timing Restrictions). These timing restrictions would be implemented to reduce impacts to the lek complex and sage-grouse that occupy portions of the tract during the nesting and brood-rearing periods by opening up potential habitats that are adjacent to occupied habitat with mixed sagebrush and junipers. Under this alternative, no surface-disturbing activities would be allowed within 0.5 mile of the lek location(s) during the lek establishment and strutting period (February 15–March 15) or in Block S (see Map 2.2) during the strutting, nesting, brooding period (March 15–July 15). There are approximately 124 acres of the tract that are within 0.5 mile of the lek and would be subject to timing restrictions during the lekking period. There are approximately 1,059 acres in Block S that would be subject to timing restrictions during the nesting and brooding period. These timing restrictions would alter the timing and distribution of mining activities, and would reduce impacts to Greater Sage-Grouse as well as to surface waters, soils, vegetation, and other wildlife and special status species. The loss of the local breeding group would be less likely under this alternative than under the Proposed Action because of the impacts avoided by employing the timing restrictions.

Under Alternative C, mining would not occur in Block NW, and impacts to that habitat would be avoided. Timing restrictions would be placed on mining activities in Block S, and pre-mining vegetation treatments (i.e., reducing conifer encroachment) would be implemented in Block Sa to minimize impacts to the Greater Sage-Grouse population currently using the tract. The sage-grouse population and its habitats would be adversely affected in both the short term and long term due to surface coal-mining activities on and adjacent to the tract, but to a lesser degree than would occur under the Proposed Action. The new Alton–Sink Valley lek location occurs on a limited-touch area on Block S of the tract. This location would not be mined, and the avoidance measures detailed in the lease stipulations would be followed so disturbance to this habitat would be minimized as much as possible. Additionally, birds from the Alton sage-grouse population use Block S during the nesting, brooding, and wintering periods. As would occur under the Proposed Action, human presence, noise, and night-lighting associated with mining activities would impact the daily habitat use patterns of individual grouse. As previously mentioned, under Alternative C, no surface-disturbing activities would be allowed within 0.5 mile of the lek(s) during the lekking period or in Block S during the nesting and brooding period; however, outside of these time periods, surface disturbance would occur and would adversely impact habitat known to be used by the local sage-grouse population. There would be potential for direct and indirect impacts associated with human presence, noise, and night lighting on the lek location, within the 0.5-mile lek buffer, and in adjacent habitats.

Fragmentation, alteration, degradation, and loss of Greater Sage-Grouse habitats are likely to occur as a result of mining activity and associated noise and human presence. Due to timing stipulations, there would be a greater area of open pits during active mining under this alternative than would occur under the Proposed Action. Development of the coal mine, removal of overburden, and surface-mining operations would result in the short-term loss of habitat resources and displacement or loss of individual birds. The reclamation and restoration plan would be designed to enhance the long-term persistence of the Alton sage-grouse population. The sage-grouse mitigation plan was developed to address potential impacts to sage-grouse (see Section 4.18.2.1.2.3 and Appendix E). The sage-grouse mitigation plan would be applied as a special lease stipulation if the tract is leased. Under this alternative, 6,052 acres of off-tract habitat would be enhanced for sage-grouse use. Due to the success of other vegetation treatments that BLM has conducted for sage-grouse within the sage-grouse analysis area (South Canyon Vegetation Enhancement and Upper Kanab Creek Watershed Improvement projects), similar treatment types would be the focus of mitigation-related efforts. These treatments would be conducted within the South Canyon Vegetation Enhancement and Upper Kanab Creek Watershed Improvement project areas. These projects have analyzed and approved 121,327 and 51,600 acres, respectively, of vegetation for treatments to take place over the next 10–15 years within the sage-grouse analysis area. Mitigation-related vegetation treatments would be prioritized in these areas; especially in areas adjacent to habitat occupied by sage-grouse. However, although mitigation and reclamation actions are expected to reduce impacts to sagebrush habitats in the short term and increase the quality and quantity of sagebrush habitats over the long term, habitat loss and disturbance associated with the coal mine could result in the short-term displacement or loss of the local population.

Under Alternative C, approximately 1,661 acres of occupied habitat in the tract would be impacted through direct surface disturbance (52.8% of tract and 0.6% of the analysis area; see Table 4.18.4). *Occupied* habitat denotes habitat that may be used throughout the year, although not all habitat is used year-round. Habitat types that would be removed include breeding, brood rearing, and wintering. According to locally collected telemetry data (Frey et al. 2013), impacts from Alternative C would result in disturbance to 1,225.5 acres of breeding habitat (17.8% of available habitat and 38.9% of the tract), 1,416.8 acres of brood-rearing habitat (16.0% of available habitat and 45.0% of the tract), 1,191.6 acres of late season brood-rearing habitat (32.7% of available habitat and 37.9% of the tract), and 1,197.0 acres of wintering habitat (30.0% of available habitat and 38.0% of the tract). Note that these habitat types overlap and do not add to a comprehensive total. Alternative C would result in more direct adverse impacts to the sage-grouse occupying the Alton–Sink Valley and their habitat than would occur under the No Action Alternative. Over the long-term, habitat restoration measures would result in improvements to the overall quantity and quality of habitats in some areas of the tract that are degraded before mining begins.

4.18.2.4.4 Alternative K1: Reduced Tract Acreage

Under Alternative K1, mining would not occur in Block NW or Block S. Pre-mining vegetation treatment would be implemented in Block Sa to minimize impacts to the Greater Sage-Grouse population in the tract. The sage-grouse population and habitats would be adversely affected in both the short and long term due to surface coal-mining activities on and adjacent to the tract, but to a lesser degree than would occur under the Proposed Action and Alternative C. Portions of the Alton–Sink Valley lek complex occur on Block S of the tract. As would occur under the Proposed Action, human presence, noise, and night lighting associated with mining activities would impact the daily habitat use patterns of individual grouse. Additionally, birds from the Alton sage-grouse population use Block S during the nesting, brooding, and wintering periods. Under this alternative, mining activities in the tract would not directly disturb the sage-grouse lek or the habitat of Block S, but there is potential for indirect impacts to a lek from human presence, noise, and night lighting associated with mining activities. Because the nesting, brood-rearing, and wintering habitat on Block S and Block NW would not be destroyed, loss of the local population is less likely under this alternative than under all other action alternatives.

Fragmentation, alteration, degradation, and loss of Greater Sage-Grouse habitats are likely to occur from mining activity and associated noise and human presence. Development of the coal mine, removal of overburden, and surface-mining operations would result in the short-term loss of habitat resources and displacement or loss of individual birds. The reclamation and restoration plan would be designed to enhance the long-term persistence of the Alton sage-grouse population. The sage-grouse mitigation plan was developed to address potential impacts to sage-grouse (see Section 4.18.2.1.2.3 and Appendix E). The sage-grouse mitigation plan would be applied as a special lease stipulation if the tract is leased. Under this alternative, approximately 3,656 acres of habitat would be enhanced for sage-grouse use. Vegetation treatments in the sage-grouse analysis area have already occurred as part of the BLM's South Canyon Vegetation Enhancement Project and the Upper Kanab Creek Watershed Improvement Project. These projects have analyzed and approved 121,327 and 51,600 acres of vegetation for treatment within the sage-grouse analysis area, respectively, of vegetation for treatments to take place over the next 10–15 years within the sage-grouse analysis area. Mitigation-related vegetation treatments would be prioritized in these areas, especially in areas adjacent to habitat occupied by sage-grouse.

Under Alternative K1, approximately 1,012 acres (48.5% of the tract and 0.4% of the analysis area) of occupied habitat in the tract would be impacted through direct surface disturbance (see Table 4.18.4). *Occupied* habitat denotes habitat that may be used throughout the year, although not all habitat is used year-round. Habitat types that would be removed include breeding, brood rearing, and wintering. According to locally collected telemetry data (Frey et al. 2013), impacts from Alternative K1 would result in disturbance to 619.0 acres of breeding habitat (9.0% of available habitat and 29.6% of the tract), 810.3 acres of brood-rearing habitat (9.2% of available habitat and 38.8% of the tract), 718.6 acres of late season brood-rearing habitat (19.7% of available habitat and 34.4% of the tract), and 628.5 acres of wintering habitat (15.8% of available habitat and 30.1% of the tract). Note that these habitat types overlap and do not add to a comprehensive total. Alternative K1 would result in more direct adverse impacts to the Alton sage-grouse population and its habitat than would occur under the No Action Alternative. Over the long term, habitat restoration measures would result in improvements to the overall quantity and quality of habitats in some areas on the tract that are degraded prior to commencement of mining.

4.18.2.5 IMPACTS FROM COAL HAULING

There would be no additional loss of special status species habitat from the reasonably foreseeable coal haul transportation route. Coal transportation would occur on existing roads and would not necessitate road upgrades. Impacts to special status species are identical to those described for wildlife (Section 4.17.5) except for the information provided in following analysis, which focuses on direct and indirect impacts to special status species from increased rates of traffic.

4.18.2.5.1 Alternative A: No Action

Impacts to Greater Sage-Grouse resulting from coal hauling under the No Action Alternative would be identical to those described for all other special status species (Section 4.18.1.5.1).

4.18.2.5.2 Alternative B (Proposed Action), Alternative C (Reduced Tract Acreage and Seasonal Restrictions), and Alternative K1 (Reduced Tract Acreage)

Impacts to Greater Sage-Grouse from the Proposed Action, Alternative C, and Alternative K1 are identical to those described for wildlife (Section 4.17.5.2) and other special status species (Section 4.18.1.5.2) with the following exceptions.

Occupied Greater Sage-Grouse habitat occurs adjacent to 40.7 miles of the reasonably foreseeable coal haul transportation route, and is displayed in Table 4.18.5.

Table 4.18.5. Greater Sage-Grouse Habitat on the Reasonably Foreseeable Coal Haul Transportation Route

Habitat*	Linear Miles	Percentage of Route
Brood-rearing	37.9	33.0%
Wintering	2.8	2.3%

* Data from UDWR (2012).

Greater Sage-Grouse that occur along the reasonably foreseeable coal haul transportation route are most likely distinct from the group that occurs in the tract due to the isolated distribution of that population.

Adverse impacts to the Greater Sage-Grouse along the reasonably foreseeable coal haul transportation route could occur from an increase in collisions with truck and commuter traffic, increased noise, and increased predator activity along roadways due to roadkill. Greater traffic volume would increase the risk of mortality of sage-grouse adults and chicks from vehicles. Noise and vibration near active leks during the breeding season could disrupt courtship behavior or prevent hens from locating lekking areas. Sage-grouse have been found to avoid lekking and brooding habitats within 1,300 feet of roads and other surface disturbances, which could cause displacement and increased competition for habitat resources (Connelly et al. 2000; Crawford et al. 2004). Any increase in roadkill could increase raptor activity along the reasonably foreseeable coal haul transportation route, which could result in increased predation on sage-grouse occupying habitats adjacent to the route. Under the Proposed Action, Alternative C, and Alternative K1, traffic and noise-related adverse impacts to the Greater Sage-Grouse and its habitats along the reasonably foreseeable coal haul transportation route would likely be greater than would occur under the No Action Alternative.

4.18.3 Potential Mitigation Measures

4.18.3.1 SPECIAL STATUS SPECIES (EXCEPT GREATER SAGE GROUSE)

Protective measures for special status animal species described above and in Management and Considerations Common to Each Action Alternative in Chapter 2 would mitigate and/or minimize impacts to special status species in the tract. Potential mitigation measures for special status animal species include those listed below. BLM will incorporate selected mitigation measures into the ROD for this EIS. Additional wildlife-related mitigation measures are listed in section 4.17.6.

- Install fencing and/or netting or other protective features around evaporation and production pits to reduce mortality of wildlife and special status species (e.g., migratory birds, raptors, bats) due to drowning or entrapment.
- In cooperation with BLM and UDWR, translocate pygmy rabbit individuals that occur in the tract into appropriate habitat in areas not planned for disturbance.

4.18.3.2 GREATER SAGE-GROUSE

Design features that have been incorporated into the analysis and target impacts to Greater Sage-Grouse are described in detail in Section 4.18.2.1.2 and have been incorporated into the impacts analysis above. The following measures have not been incorporated into the analysis and may be incorporated by the BLM into the ROD.

- Limit the time standing water is left in ponds to less than 48 hours to prevent the potential for West Nile virus in the Greater Sage-Grouse population.
- Monitor and treat water storage impoundments to prevent mosquito breeding and the associated spread of West Nile virus to the Greater Sage-Grouse population.
- Develop an adaptive management plan based on results of Greater Sage-Grouse population monitoring that incorporates an assessment of whether habitat needs are being met by vegetation treatment, reclamation, and mitigation actions; “lessons learned” and recommendations for future avoidance; and minimization and mitigation strategies based on “lessons learned”.
- Employ noise-reducing measures (e.g., hospital grade mufflers and/or timing limitations on noisy activities) within 5 km of the lek during the breeding and nesting season (March 15–July 15).
- For Alternative K1 only, complete vegetation treatment (conifer removal) in Block Sa before mining begins. This potential mitigation measure is necessary because alternative K1 does not include Block S, and so the lease stipulation to complete pre-mining vegetation treatment in Block Sa would not apply if Alternative K1 is chosen. Pre-mining vegetation treatments are necessary to maintain compliance with the Washington Office IM 2012-043 (BLM 2011b).

4.18.4 Unavoidable Adverse Impacts

Unavoidable adverse impacts would occur where the loss of a special status species individual occurs during mining pit disturbance, soil stockpiling, road and infrastructure development, or regular mine operations. Unavoidable loss could occur where special status species individuals are not detected or identified during surveys. Unavoidable loss of special status species individuals due to nondetection or inadvertent adverse impacts would also occur. There would also be unavoidable, short-term loss of special status species habitats as a result of mining operations.

4.18.5 Short-term Uses versus Long-term Productivity

The short-term use of the tract for coal extraction would result in reduced structural and compositional diversity and reduced long-term productivity of special status species habitats. The habitats present in the tract are typically slow to recover from disturbance, and productivity would be limited during reclamation and restoration activities. Long-term productivity would be reduced because vegetation communities would not develop immediately following mining and restoration activities. Until they are fully developed, these habitats would be less diverse and less productive, particularly if critical habitat components such as biological soil crusts and other soil properties have been lost. Effective implementation of the mitigation measures outlined above would minimize impacts to the long-term productivity of these vegetation communities and the special status species that rely on them.

4.18.6 Irreversible and Irretrievable Commitments of Resources

Under the Proposed Action, Alternative C, and Alternative K1, special status species forage and cover removed for surface mining would be irretrievably altered during the life of the mine. Once impacted by surface mining, dispersed and centralized facilities, roads, and ROWs, the productivity of vegetation communities would be irretrievably removed or reduced until reclamation and restoration have been completed. The loss of special status animal individuals from mining and associated activities and from coal truck strikes along the reasonably foreseeable coal haul transportation route would constitute an irreversible commitment of the resource because these individuals would be permanently lost.

4.19 Cumulative Impacts

Cumulative impacts are the environmental effects that result from the incremental impacts of an action, when added to other past, present, and RFFAs, regardless of who is responsible for such actions (40 CFR 1508.7). Past actions are those that have created the affected environment, as described in Chapter 3 of this SDEIS. Present actions are those that are occurring at the time of this evaluation. RFFAs are actions that are planned, funded, or reasonably foreseeable based on known opportunities or trends in the next 20 years. Cumulative impacts can result from individually minor, but collectively substantial actions occurring over time. This section analyzes the cumulative impacts to specific resource values and uses that would occur from implementation of the Proposed Action, Alternative C, and Alternative K1 when added to other past, present, and RFFAs that are not associated with this action.

In general, the geographic scope of this analysis—the CIAA—is the BLM-KFO, approximately 2.85 million acres of lands in Kane and Garfield counties, and the reasonably foreseeable coal haul transportation route (Map 4.6). This area was selected because the BLM recently completed the KFO RMP, a large-scale, land use planning effort that includes a cumulative impact assessment of this area. This analysis provides good baseline information for comparison with the effects of potential mining operations on the tract and coal haulage on the reasonably foreseeable coal haul transportation route. Overall, the CIAA provides a reasonable area for analysis of 1) the cumulative impacts of mining the tract and 2) other actions on the multiple resource values and uses of the CIAA. It does this because 1) there is a reasonable degree of data available to conduct the analysis, 2) it is large enough to account for resource impacts where impacts may be far-reaching (e.g., watersheds and wildlife), and 3) it is small enough that analyses do not become unreasonably cumbersome to complete with an acceptable degree of accuracy and precision. However, for certain resource values and uses, the CIAA may be slightly different than that described here. In these cases, the modified CIAA is described and explained. The timeframe for analysis of cumulative impacts is approximately 20 years.

The following list comprises land use planning and environmental documents that were consulted to determine the existing and RFFAs that are analyzed in this cumulative analysis:

- Coal Hollow Mine Permit C/025/005 (private fee coal area)
- KFO RMP (BLM 2008b)
- *Alton Road Relocation Environmental Assessment* (BLM 2008f)
- *Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States* (BLM and DOE 2008)

Although much of the cumulative impact analysis focuses on *adverse* cumulative impacts, cumulative impacts may also be beneficial. For example, beneficial economic impacts from coal mining would include additional employment, additional tax revenues to local governments, and additional royalties to the federal government. Further, vegetation treatments planned in the BLM-KFO create long-term beneficial impacts to sage-grouse and other sagebrush-obligate species in terms of habitat enhancement.

The BLM is also currently revising its land use plan amendment for Greater Sage-Grouse management. The purpose of this plan amendment is to provide the BLM with regulatory mechanisms to avoid the continued decline in sage-grouse populations that are anticipated across the species' range. It is likely that the results of this revision will have a restrictive effect on surface-disturbing actions affecting sage-grouse habitat. Such restrictions would also likely limit surface-disturbing impacts on other natural resources where these resources overlap sage-grouse habitat. This would have a countervailing effect to the potential adverse effects that the Proposed Action and alternatives would have on these natural resources in the CIAA. Because the BLM has not made a final decision on the land use plan amendment, the specific impacts resulting from the plan amendment are not yet known and are not incorporated into this cumulative impacts analysis in detail. However, in October 2013, the BLM published its draft land use plan amendment and EIS for the Utah Greater Sage-Grouse (BLM 2013c). That document contains a cumulative impact assessment related to all the land use plan amendment alternatives analyzed.

Section 4.19.1 identifies and summarizes the RFFAs included in this cumulative impact analysis. Past and present actions have generally been described in the affected environment and are summarized in this cumulative impacts analysis under each resource heading.

4.19.1 Reasonably Foreseeable Actions and Development

This section incorporates ongoing, proposed, and potential projects in Kane and Garfield counties in the CIAA. For the purposes of analysis, the RFFAs come from the proposed actions and records of decision from the land use planning and environmental documents identified in the list above. These RFFAs are not to be considered part of the Proposed Action, Alternative C, or Alternative K1. Table 4.19.1 summarizes the RFFAs and anticipated acres of disturbance. Tables 4.19.2 and 4.19.3 summarize the surface disturbance and subsidence disturbance from the Proposed Action and alternatives for mining the tract. The discussion that follows provides further explanation of the information in the tables.

Table 4.19.1. Reasonably Foreseeable Actions and Development in the Cumulative Impact Assessment Area, Next 20 Years

Action	Anticipated Disturbance (acres)	Total Anticipated Disturbance (%)
Wildfire	3,476	4.6%
Wildfire use	390	0.5%
Prescribed fire	800	1.1%
Vegetation treatments	60,000	78.9%
Alton Coal Mine, northern private coal area (permit application not submitted)	378	0.5%
Coalbed CH_4 exploration	0	0%
Oil and gas exploration, development, and production	2,070	2.7%
Seismic exploration	906	1.2%
Mining alabaster and septarian nodules	20	0.03%
Sand and gravel production	625	0.8%
Building stone production	400	0.5%
Clay production	5	0.01%
Cross-country OHV travel	1,000	1.3%
Lake Powell pipeline	5,745	7.6%
Future West-wide Energy Corridor development	0	0.0%
Wind energy development	0	0.0%
SITLA Exploration Agreement and Option to Lease	1,255	0.0%*
Total	**75,815**	**100.0%†**

* The acreage affected by the SITLA Exploration Agreement and Option to Lease would result from the potential subsidence caused by underground mining. Thus, it would not be direct surface disturbance and is not included in the total RFFA surface disturbance.

† The total surface disturbance is less than 100% because surface disturbance resulting from the West-wide Energy Corridor, wind energy development, and coalbed CH_4 exploration is not known at this time.

Table 4.19.2. Additional Surface Disturbance from Mining the Alton Coal Tract

	Additional Surface Disturbance (acres) from Mining Operations on the Alton Coal Tract	Increase in Surface Disturbance in the CIAA over the next 20 years from Mining Operations on the Alton Coal Tract (%)
Proposed Action	1,993	2.6%
Alternative C	1,662	2.2%
Alternative K1	1,012	1.3%

Table 4.19.3. Additional Subsidence Disturbance from Mining the Alton Coal Tract

	Additional Subsidence Disturbance (acres) from Mining Operations on the Alton Coal Tract	Increase in Subsidence Disturbance in the CIAA over the next 20 years from Mining Operations on the Alton Coal Tract (%)
Proposed Action, Alternative C, and Alternative K1	779	62.1%

RFFAs in the CIAA would impact 75,815 surface acres. Under the Proposed Action, the tract would directly impact 1,993 acres, which is a 2.6% increase in the total surface disturbance in the CIAA over the next 20 years. Alternative C would directly impact 1,662 acres, which is a 2.2% increase in the total disturbance in the CIAA over the next 20 years. Alternative K1 would directly impact 1,012 acres, which is a 1.3% increase in the total disturbance in the CIAA over the next 20 years.

4.19.1.1 MINERALS AND ENERGY EXPLORATION, DEVELOPMENT, AND PRODUCTION

4.19.1.1.1 Exploration, Development, and Production of Coal

In November 2010, the State of Utah approved a permit for the Coal Hollow Mine (Permit #C/025/005) on approximately 424 acres of private lands. The tract is currently being developed by surface mining methods. ACD is also pursuing development of an additional coal mine on 378 acres. This area is referred to as the “northern private coal area” in Table 4.19.1 and generally referred to on maps as the “potential fee coal mine”. The permitting process for the northern private coal area is currently ongoing. These two private areas are adjacent to federally administered coal that BLM is considering for competitive leasing in this SDEIS.

Furthermore, pursuant to an Exploration Agreement and Option to Lease between ACD and SITLA, exploration and possible underground coal mining operations on state-owned coal (in Section 36, Township 39 South, Range 5 West and Section 2, Township 40 South, Range 5 West, Kane County, Utah) are RFFAs (SITLA 2013). The exploration and underground mining covers a maximum acreage of approximately 1,255 acres. Thus, there would be a potential for a maximum of approximately 1,255 acres of subsidence effects in this area of Kane County. Subsidence is the gradual lowering of the land surface as coal is removed underground. The level of subsidence generally depends on the thickness of the coal extracted and the thickness of the overburden, as well as other geological factors. Subsidence has the potential to affect resources such as topography, geology, visual resources, and water resources if any are present in the area of potential subsidence. At this time, there are not enough details known about these potential mining activities to estimate the level of subsidence that would result.

Coalbeds that have not been mined or are too deep and/or thin for surface or underground mining often have recoverable coalbed CH_4. To extract coalbed CH_4, water permeating the coalbed is drawn off first, allowing CH_4 to flow out of the coalbed and into a well bore. Although there are no existing permits for coalbed CH_4 extraction in the CIAA, there is the potential for a concentration of coalbed CH_4, but not anticipated at the depths planned for this lease tract.

4.19.1.1.2 Exploration, Development, and Production of Oil and Gas and Other Leasable Minerals, Salable Minerals, and Mining under the Mining Laws

In all, 90 oil and gas wells (70 exploration wells and 20 production wells) could be drilled on public lands managed by the BLM-KFO over the next 15–20 years. This exploration, development, and production could disturb 2,070 acres, and seismic operations could disturb an additional 906 acres. Of this total disturbance, 2,370 acres could be reclaimed.

Septarian and gypsum (alabaster) mining could disturb 1 acre per year, or 20 acres over the next 15–20 years.

Surface disturbance from salable mineral production (sand, gravel, building stone, and clay) could be 1,030 acres over the next 15–20 years. Of that total, sand and gravel operations could disturb 625 acres, building stone operations could disturb 400 acres, and clay production could disturb 5 acres.

4.19.1.2 UTILITY CORRIDORS AND TRANSMISSION LINES

4.19.1.2.1 West-wide Energy Corridor

The *Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States* analyzes the environmental impacts of designating more than 6,000 miles of energy corridors on federal land in 11 western states (BLM and DOE 2008). One corridor has been designated by the KFO RMP in the CIAA. Future development within the designated energy corridor can be expected.

4.19.1.3 WATER PROJECTS

4.19.1.3.1 Lake Powell Pipeline

The State of Utah Board of Water Resources and Washington, Kane, and Iron counties are pursuing the construction of a pipeline that would run from Lake Powell to Sand Hollow Reservoir, approximately 10 miles east of St. George. The pipeline would consist of approximately 120 miles of 66-inch pipe and 38 miles of 30-inch pipe north from Sand Hollow to Cedar City. The corridor is anticipated to be 300 feet wide. As part of the initial feasibility studies, various alternative alignments are being investigated. The pipeline would bring 70,000 acre-feet of water to Washington County, 10,000 acre-feet to Kane County, and 20,000 acre-feet to Iron County. Construction of the pipeline is estimated to take three years.

4.19.1.4 ROAD PROJECTS

4.19.1.4.1 U.S. Highway 89

US-89 is expected to be widened over the next 20 years. The widening of the highway would allow for an increase in traffic volume. In addition, portions of the highway would be developed into a four-lane divided highway.

4.19.1.5 VEGETATION TREATMENTS

Historically, the BLM has treated on average 3,000 acres of upland vegetation annually. Using this average, it is estimated that the BLM would treat 60,000 acres over the next 20 years (Church 2010). These treatments are to enhance wildlife habitat, restore watershed condition, increase livestock forage, and reduce fuel loading. A full range of upland vegetation treatment methods would be used, including wild and prescribed fire; mechanical, chemical, and biological treatments; and woodland product removal. There are currently two approved burn plans in the KFO totaling 800 acres (BLM 2001b, 2002). According to the KFO RMP, wildfire use disturbance over the next 20 years would total 390 acres (BLM 2008b).

4.19.1.6 WILDFIRE

A five-year average for wildfires in the KFO totals approximately 869 acres (Church 2010). Using these past numbers, it is estimated that wildfires would disturb 3,476 acres over the next 20 years.

4.19.1.7 LAND USE PLANNING AND DEVELOPMENT

As communities in the CIAA continue to grow, agricultural lands are expected to be converted to residential and commercial uses. There is no specific projection as to the number of acres per year that would be converted, but for analysis purposes, growth (and thus, conversion of agricultural land) is expected to continue at a steady pace. Under the KFO RMP, BLM has identified 6,000 acres potentially available for sale over the next 20 years. If disposed of, these lands would provide for the needs of the communities in the field office area. Assuming these lands would be developed for public purposes, 320 acres per year would convert to community purposes.

4.19.2 Cumulative Impacts Related to the Proposed Action and Alternatives

4.19.2.1 AESTHETIC RESOURCES

4.19.2.1.1 Cumulative Impact Analysis Area

The geographic extent of the CIAA for aesthetic resources consists of the BLM-KFO and the coal haul transportation route to the loadout west of Cedar City, Utah. It includes sensitive viewpoints and soundscapes in Bryce Canyon National Park to the east, Dixie National Forest to the east and west, and the communities along the coal haul transportation route (Map 4.7). The area was selected to incorporate lands where aesthetic resources would be affected regardless of administrative jurisdiction. The area is primarily used for agriculture, travel, tourism, and recreational activities.

4.19.2.1.2 Soundscape

Past and present actions that have resulted in ambient and existing noise levels in the characteristic soundscapes of the CIAA (as described in Section 4.19.2.1.1 above) include vehicle traffic on the coal haul transportation route, motorized recreation, mineral material mining, mechanical vegetation treatments, and wild and prescribed fire operations. Measured ambient and existing noise levels at specific locations in the CIAA are described in Section 3.2.1.4.

Future actions include the expansion of US-89; the realignment of KFO Route 116; construction of the Tropic to Hatch transmission line; coal mining near the Town of Alton (private coal); oil and gas exploration, development, and production; continued sand and gravel, building stone, and clay mining; additional vegetation treatments; continued wild and prescribed fire operations; construction of the Lake Powell pipeline; continued growth in OHV use and backcountry driving; and construction of facilities within a utility corridor as part of the West-wide Energy Corridor grid. The level of disturbance associated with these actions can be described in terms of acres, a proxy to describe areas where noise would be generated. All of the projected actions combined could disturb approximately 75,815 acres of lands. That said, RFFAs would only result in cumulative impacts if they were to occur at the same time (temporally) and/or in the same place (spatially). This analysis is conservative because it assumes that the RFFAs overlap with one and other and with mining on the tract.

Mining operations on the Alton Coal Tract under the Proposed Action would disturb approximately 1,993 acres, a 2.6% increase in the entire disturbance associated with the RFFA. Under Alternative C, mining operations on the Alton Coal Tract would disturb approximately 1,662 acres, or a 2.2% increase in the entire disturbance associated with the RFFA. Under Alternative K1, mining operations on the Alton Coal Tract would disturb approximately 1,012 acres, or a 1.3% increase in the entire disturbance associated with the RFFA. Using the amount of surface disturbance as an indication of noise levels associated with this activity, coal mining on the tract would contribute less than 3% of future anticipated surface disturbance, and thus ambient noise to soundscapes. Individuals in Alton would experience noise levels above ambient (traffic, conversations, appliances, electronics, pets, and airplanes flying overhead) and above regulatory thresholds for human annoyance by blasting noise and vibration as described in Table 4.2.4. Mitigation measures could be implemented with the Proposed Action, Alternative C, or Alternative K1 to reduce the impacts of increased noise levels on noise-sensitive receptors. Additionally, noise from the Proposed Action, Alternative C, or Alternative K1 would occur only for the duration of active mining.

Blasting as a result of mine activities would be heard and felt at sensitive noise receptors as described in Section 4.2.2.2.2. Cumulative vibration levels could be felt in the town of Alton if blasting on the tract occurs simultaneously with blasting on the Coal Hollow Mine or the northern private fee coal area. However, it is unlikely that blasting on two different mines would occur at the exact same time, and operators could be required to communicate with one another in advance of planned blasting events to prevent such an occurrence. Blasting impacts would contribute to cumulative vibration impacts in the town of Alton. **C**umulative impacts to structures that could be damaged by blasting vibration could occur over time from subsequent blasting events, both on the tract and from the RFFAs on the Coal Hollow Mine or the northern private fee coal area.

As discussed in Appendix H and Section 4.14.3, traffic volume increases on SR-89 through Hatch and Panguitch are expected to increase by 2020. Mine-related transport activities are expected to account for approximately 4% of the total increased traffic volume on SR-89 in the year 2020. Because the modeled values for noise impacts to Hatch and Panguitch are within the currently measured baseline values, any future increase in roadway noise above currently measured background levels is expected to be from traffic increases unrelated to mine activities.

4.19.2.1.3 Visual Resources

The CIAA for visual resources consists of the BLM-KFO, including the viewshed surrounding the tract as well as portions of the Dixie National Forest and private lands. Past and present actions have contributed to modifications to the characteristic landscape in the CIAA, including mechanical vegetation treatments, transmission lines, and other linear ROWs. The characteristic landscape is described in Section 3.2.

RFFAs that would contribute to cumulative impacts to the landscape (visual resources) consist of cross-country OHV travel, additional vegetation treatments, coal mining private coal near the town of Alton, oil and gas exploration and production, mining, sand and gravel and building stone production, and development of pipelines and power lines (see Table 4.18.1). Over the next 20 years, reasonably foreseeable future development would change the character of the existing landscape. Reasonable foreseeable actions could remove vegetation by fire and land treatment methods, change landform by surface disturbance during mining and road building, and introduce linear structures, such as power lines and pipelines, to the landscape. These developments would introduce moderate to noticeable changes to the characteristics landscape (visual resources) on as much as 75,815 acres.

The incremental impacts of mining coal on the Alton Coal Tract under the Proposed Action, Alternative C, or Alternative K1 would add moderate to strong contrasts to the characteristic landscape on up to 1,993, 1,662, or 1,012 acres, respectively. These impacts would be spread out over the active mining period and would result in cumulative impacts to the viewshed. Over the next 20 years, coal mining on the Alton Coal Tract would increase disturbance by approximately 2.6% under the Proposed Action, 2.2% under Alternative C, and 1.3% under Alternative K1 in the CIAA. Mitigation measures would be implemented to return the tract to a more natural landscape as pit activities are completed. The analysis assumes that mitigation measures for visual resources would be implemented with reasonably foreseeable future projects to reduce contrasts. Cumulatively, contrasts would remain consistent with applicable BLM VRM Class objectives in the CIAA.

Pursuant to an Exploration Agreement and Option to Lease between ACD and SITLA, exploration and possible underground coal mining operations in Kane County could result in a maximum of approximately 1,255 acres of subsidence impacts. The level of subsidence generally depends on the thickness of the coal extracted and the thickness of the overburden, as well as other geological factors. Subsidence could impact the topography of the area mined, creating visual impacts. At this time, there are not enough details known about these potential mining activities to estimate the level of subsidence that would result. The visual impact from subsidence would generally be small when compared to the surface disturbance caused by surface mining, but would add incrementally to the cumulative disturbance to visual resources from other mining activities in the CIAA.

4.19.2.1.4 Night Sky

The CIAA consists of the lands surrounding the tract, including portions of Bryce Canyon National Park, Dixie National Forest, and private lands. Because of the nature of artificial light, the area of analysis must be larger than the tract's viewshed. Past and present actions in the area of analysis that have contributed to the existing night sky conditions include the development of towns and cities in the region, management of Bryce Canyon National Park, residential development, and tourism facilities. Future actions include expansion of US-89 and population growth in existing towns and cities in the region. Future construction-related actions would increase the amount of light seen during construction, but these impacts would be temporary (limited to the construction timeframe). However, increased uplight lumens over time from projected population growth in the region from 2010 to 2040 are shown in Table 4.19.4.

Table 4.19.4. Light Source Locations and Output with Projected Population Growth

Town/City	2010 Population	Total Estimated Lumens 2010	2040 Projected Population	Total Projected Lumens 2040
Alton	119	297,500	210	526,147
Brian Head	83	207,500	157	391,518
Cedar City	28,857	72,142,500	54,448	136,121,050
Fredonia	1,314	3,285,000	1,403	3,507,500
Glendale	381	952,500	674	1,684,555
Kanab	4,312	10,780,000	7,626	19,065,092
Orderville	577	1,442,500	1,020	2,551,150
Page	7,247	18,117,500	8,303	20,757,500
Panguitch	1,520	3,800,000	2,162	5,405,375

Table 4.19.4. Light Source Locations and Output with Projected Population Growth

Town/City	2010 Population	Total Estimated Lumens 2010	2040 Projected Population	Total Projected Lumens 2040
St. George	72,897	182,242,500	196,206	490,514,236
Tropic	530	1,325,000	754	1,884,769
Total	**117,837**	**294,592,500**	**272,964**	**682,408,892**

Source: U.S. Census Bureau (2013k); UGOPB (2013).

Table 4.19.4 shows that as population increases in the 11-town region over the next 30 years, total lumens output (at an estimated 2,500 lumens per capita) would increase approximately 132% from 295 million lumens in 2010 to 682 million lumens in 2040.

The 2,500 lumens-per-capita assumption does not account for uplight because only a small fraction of lumens output from human settlements gets reflected upward into the atmosphere (see Figure 4.2.6). Therefore, uplight is accounted for by two potential future scenarios: 1) a 10% uplight fraction, and 2) a 5% uplight fraction (see Appendix J). The 5% uplight fraction scenario represents an optimistic scenario where lighting ordinances, conservation, technological improvements, or a combination thereof decrease the uplight fraction of human settlements in 2040 by half (from 10% uplight to 5% uplight).

Assuming an uplight fraction of 10%, approximately 29 million uplight lumens in 2010 would grow, as the population grows, to an estimated 68 million uplight lumens in 2040. Assuming a reduced uplight fraction of 5%, the predicted uplight lumens for 2040 would be reduced to 34 million lumens. Future mine lighting scenarios also vary depending on how many portable and mobile light sources are analyzed (see Section 4.2.4.2.1), and are presented as three possible future uplight scenarios. Under Scenario 1, the mine is expected to produce 241,900 annual uplight lumens, 869,160 annual uplight lumens under Scenario 2, and 1,628,160 annual uplight lumens under Scenario 3.

Accounting for future population increases, two potential future uplight fraction scenarios, and three potential mine lighting scenarios, Table 4.19.5 shows the relative contribution to uplight lumens of the mine over time. The relative contribution to uplight lumens is calculated by dividing the expected lumens uplight output for each mine scenario by the expected lumens uplight output for current and future uplight lumens estimates (a 10% uplight fraction in 2010 results in an output of 29 million uplight lumens, a 10% uplight fraction in 2040 results in an output of 68 million uplight lumens, and a 5% uplight fraction in 2040 results in an output of 34 million uplight lumens).

Table 4.19.5. Current and 2040 Cumulative Contribution to Uplight Lumens at 5% and 10% Uplight Fractions for Mine Lighting Scenarios 1–3

Scenario	Net Uplight Lumens Output	Contribution to Uplight Lumens (at 2010 population levels) Assuming a 10% Uplight Fraction	Cumulative Contribution to Uplight Lumens in 2040 Assuming a 10% Uplight Fraction	Cumulative Contribution to Uplight Lumens in 2040 Assuming a 5% Uplight Fraction
1	241,900	0.8%	0.4%	0.7%
2	869,160	3.0%	1.3%	2.5%
3	1,628,160	5.5%	2.4%	4.8%

As shown in Table 4.19.5, at current population levels and a 10% uplight fraction, the mine would be estimated to contribute between 0.8% and 5.5% to overall uplight lumens in the region. Assuming a 10% uplight fraction in 2040, the mine's estimated contribution to overall uplight lumens would be between 0.4%

(mine lighting Scenario 1) and 2.4% (mine lighting Scenario 3). Lastly, assuming a 5% uplight fraction in 2040, the mine's estimated contribution to overall uplight lumens would be between 0.7% (mine lighting Scenario 1) and 4.8% (mine lighting Scenario 3).

Table 4.19.4 shows that the mine's relative contribution to uplight lumens over time decreases under both future uplight fraction assumptions. Assuming a 10% uplight fraction, the mine's relative contribution to uplight lumens by 2040 would decrease by between 0.4% (from 0.8% to 0.4% contribution) and 3.1% (from 5.5% to 2.4% contribution) as compared to current estimated levels. Assuming a 5% uplight fraction, the optimistic scenario, the mine's relative contribution to uplight lumens is expected to decrease in 2040 by between 0.1% (from 0.8% to 0.7%) and 0.7% (from 5.5% to 4.8%) in 2040, also resulting in a decreased cumulative impact to uplight lumens over time. These calculations demonstrate that an increase in population over time in the region results in a decreased cumulative impact to uplight lumens over time from the mine, regardless of uplight scenario or mine lighting scenario.

4.19.2.2 AIR RESOURCES

The CIAA for air resources is the 300 × 300–km area depicted in Map 3.5. The tract and the reasonably foreseeable coal haul transportation route are in this area with the tract in the approximate center.

4.19.2.2.1 Cumulative Emission Inventory

The cumulative emission inventory is composed of 1) an inventory of emissions from the reasonably foreseeable coal haul transportation route, and 2) an inventory of emission sources within a 300 × 300–km area. The cumulative inventory includes the identification and evaluation of permitted source changes (increases or decreases), RFFAs, and RFDs.

It was assumed that all existing permitted emission sources are included in the background concentrations estimates. The cumulative emission inventory was developed based on any Title V major modifications and new minor- or major-source permits that occurred after September 1, 2008. The data were obtained from the state air resources regulators (e.g., Utah, Nevada, and Arizona) in the emission inventory domain. RFFA and RFD sources are proposed sources and include new sources expected from BLM- and USFS-related activities, such as oil and gas development and mining. Oil and gas commissions in the various states and other state agencies also provided information on planned, new emission-producing sources. Because of the uncertainty in projected traffic increases on the existing road network, only mine-related transportation increases are considered in the analysis. RFFA and RFD sources evaluated in the modeling domain are listed in Table 4.19.6, and the projected emissions from these RFFA and RFD sources are presented in Table 4.19.7.

Table 4.19.6. Sources of Potential Reasonable Foreseeable Future Actions and Reasonable Foreseeable Developments in the Modeling Domain

NEPA Documents, Land Use Plans, and Personnel	Disposition
Oil and Gas Leasing on Lands Administered by the Dixie National Forest Draft EIS	Dixie and Fishlake national forests oil field development are included as point sources in cumulative modeling (20-well oil field development in Dixie National Forest; directional drilling from 3 well pads in Fishlake National Forest).
BLM-KFO RMP	90 new production wells over 20 years (4.5 wells per year); no production or drilling of coalbed CH_4 wells; no oil wells
BLM-KFO Mineral Potential Report	Uses highest projected pollutant emissions for oil and gas and area sources
	Includes lands and realty, livestock grazing, OHVs, resource roads, saleable minerals, and vegetation

Table 4.19.6. Sources of Potential Reasonable Foreseeable Future Actions and Reasonable Foreseeable Developments in the Modeling Domain

NEPA Documents, Land Use Plans, and Personnel	Disposition
	Eliminates coal mining (projected mine is the Alton Coal Tract)
	Eliminates prescribed burning as a cumulative source because it is intermittent and regulated such that it occurs during favorable weather conditions
BLM Richfield Field Office RMP	Oil well and non-oil well activities: 30 wells per year
	Uses highest projected pollutant emissions for oil and gas and area sources
	Included lands and realty, livestock grazing, OHVs, resource roads, saleable minerals, and vegetation
	Eliminates coal mining (outside domain)
BLM Cedar City Field Office	No sources to add
BLM St. George Field Office	No sources to add
BLM Ely Field Office	No sources to add
BLM Las Vegas Field Office	No sources to add
BLM Arizona Strip Field Office	No sources to add
UDAQ: Permit Actions	Two new gas turbines at St. George City Power
Arizona Department of Environmental Quality: Permit Actions	EPA PSD permit: Modification to Navajo generating station
Nevada Department of Environmental Quality: Permit Actions	No sources to add
UDOT	No sources to add

Table 4.19.7. Emissions (TPY) from Potential Reasonable Foreseeable Future Actions and Reasonable Foreseeable Developments in the Modeling Domain

	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOCs	HAPs
Dixie National Forest	84.0	36.8	529.8	28.6	–	–	–
Fishlake National Forest	30.9	21.1	364.9	17.7	–	–	–
BLM-KFO RMP	15	10	10	0	692	258	26
BLM Richfield Field Office RMP	58.0	18.0	230.5	3.8	558.0	177.1	17.7
UDEQ: St George City Power	–	–	33.3	–	34.4	–	–
Arizona DEQ: Navajo generating station modifications*	–	–	-22,386	–	36,570	–	–
Total RFFA and RFD	**188**	**85**	**-21,217**	**50**	**37,855**	**435**	**44**

* Planned modifications at the Navajo generating station result in a net decrease of total RFFA and RFD NO_x emissions.

Table 4.19.7 shows reasonably foreseeable changes in emissions (increases or decreases) from the RFFA and RFD sources in the modeling domain from September 1, 2008 onward. The decrease in NO_x emissions from the Navajo generating station (22,386 TPY) was described in the PSD permit (AZ-08-01) issued to the facility on November 20, 2008 (EPA 2008). The permit indicated that voluntary emission reduction projects were to be implemented at the Navajo generating station by retrofitting three boilers with low-NO_x burners and separated over-fire air systems. The emission reduction projects were to be completed by the end of 2011.

4.19.2.2.2 Cumulative Impacts Results

An ambient, air resources impact assessment was performed to quantify cumulative impacts near the tract and in the far-field modeling domain. To demonstrate that air quality standards and AQRV are protected, the RFFA and RFD sources were modeled in conjunction with the tract sources. The KFO RMP sources are in the near-field modeling domain; the remaining RFFA and RFD sources are in the far-field modeling domain.

4.19.2.2.3 Cumulative National Ambient Air Quality Standards and Hazardous Air Pollutants Results

The modeling results indicate that there is minimal interaction between the RFFA/RFD sources and the receptors exhibiting the highest concentrations in the tract-only analysis. Therefore, the results and conclusions drawn for the PM_{10}, $PM_{2.5}$, NO_2, CO, SO_2, and HAPs are as presented in Table 4.3.4, Tables 4.3.7 through 4.6.10, and Tables 4.3.12 and 4.3.13 in Section 4.3.3.

4.19.2.2.4 Class I and Class II Increments Results

Under federal and state PSD regulations, increases in ambient air concentrations in Class I areas are limited by PSD Class I increments. Specifically, emissions associated with a particular development may increase ambient concentrations above baseline levels only within those specific increments developed for SO_2, PM_{10}, and NO_2. The modeling results for the maximum cumulative scenarios are presented in Table 4.19.8 for the near-field Class I and II areas and Table 4.19.9 for the far-field Class I and II areas. The modeling included the Alton sources and all regional background sources. Negative values indicate a net improvement due to cumulative sources showing a net reduction in emissions. The analysis did not follow the methodology for a regulatory PSD increment analysis, and the increment comparison is included to disclose maximum cumulative scenario impacts.

Table 4.19.8. Cumulative Near-field Class I (Bryce Canyon National Park) and Class II (Grand Staircase-Escalante National Monument) Results, Alternative C, 200-foot Overburden Removal

Pollutant	Averaging Period	Class I Analysis Results		Class II Analysis Results	
		Cumulative Concentration ($\mu g/m^3$)	Class I Increment ($\mu g/m^3$)	Cumulative Concentration ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)
PM_{10}	Annual	0.01	4	0.33	17
	24-hour	0.30	8	2.39	30
SO_2	Annual	0.01	2	0.00	20
	24-hour	0.01	5	0.03	91
	3-hour	0.06	25	0.20	512
NO_x	Annual	0.04	2.5	1.73	25
$PM_{2.5}$	Annual	0.00	n/a	0.08	n/a
	24-hour	0.07	n/a	0.93	n/a
CO	8-hour	31	500*	92	500*
	1-hour	91	2,000*	541	2,000*

* CO modeling significance level.

Table 4.19.9. Cumulative Far-field Class I (Zion, Grand Canyon, and Capitol Reef National Parks) and Class II (Grand Staircase-Escalante National Monument) Results, Alternative C, 200-foot Overburden Removal

Pollutant	Averaging Period	Class I Analysis Results		Class II Analysis Results	
		Cumulative Concentration (μg/m^3)	Class I Increment (μg/m^3)	Cumulative Concentration (μg/m^3)	Class II Increment (μg/m^3)
PM_{10}	Annual	0.14	4	0.03	17
	24-hour	1.06	8	0.24	30
SO_2	Annual	0.00	2	0.00	20
	24-hour	0.02	5	0.01	91
	3-hour	0.06	25	0.07	512
NO_x	Annual	0.01	2.5	-0.01	25
$PM_{2.5}$	Annual	0.01	n/a	0.00	n/a
	24-hour	0.04	n/a	0.02	n/a
CO	8-hour	25	500*	52	500*
	1-hour	108	2,000*	118	2,000*

* CO modeling significance level.

Because modeling shows values far below the relevant increments, results are only presented for the cumulative sources with the tract maximum emission rate case (200-foot overburden removal, Alternative C). Impacts from the other alternatives would be less than presented here. The impacts are significantly below both the Class I and Class II increments. Even though there are no increments for $PM_{2.5}$ or CO, results are presented in Tables 4.19.8 and 4.19.9 to convey a general impression of impact levels.

4.19.2.2.5 Visibility

Cumulative visibility results for the Proposed Action are presented in Tables 4.19.10 (Method 6) and 4.19.11 (Method 8). Using Method 6, Bryce Canyon and Capitol Reef national parks have visibility extinction changes that surpass 10%, with maximums of 10.9% and 10.5%, respectively. These impacts are due to one of the regional sources (i.e., Dixie Oil Field Development), because the tract-alone impacts at Capitol Reef National Park are small (maximum change of 1.3%). With Method 6, Bryce Canyon and Capitol Reef national parks had one day with impacts greater than 10%. Four of the five parks and monuments have visibility extinction changes that surpass 5%, with a maximum of seven days exceeding 5% (at Bryce Canyon National Park). The cumulative visibility results for Method 8 show all parks and monuments with percentage changes below 5%, with the exception of 5.2% in 2002 at Zion National Park.

The tract-alone visibility modeling for the Proposed Action was performed with VISCREEN. It is likely that the cumulative impacts at Bryce Canyon National Park are attributable to Alton emissions. Based on the results presented in Table 4.3.17, the cumulative impacts at Zion National Park and Grand Canyon National Park are attributable to Alton emissions. At Grand Staircase–Escalante National Monument, approximately 48% of the cumulative impact is attributable to Alton emissions. The remaining portion is attributable to other regional sources.

Table 4.19.10. Cumulative Visibility Results, Alton Coal Tract, Proposed Action, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 6*	**Proposed Action, 200-foot Overburden**		
Class I/Class II Area	**No. of Days > 5%†**	**No. of Days > 10%†**	**Max. Change (%)**
Bryce Canyon National Park	7 (in 2002)	1 (in 2002)	10.9 (in 2002)
Capitol Reef National Park	4 (in 2003)	1 (in 2001)	10.5 (in 2001)
Grand Canyon National Park	0	0	3.1 (in 2001)
Zion National Park	3 (in 2002)	0	5.9 (in 2002)
Grand Staircase-Escalante National Monument	2 (in 2002, 2003)	0	5.8 (in 2003)

* Method 2 results can be found in the *Supplement to Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* in Appendix K. Method 6 results are shown here because they indicate the overall highest impact. One individual max. change % for Method 2 is higher at Bryce Canyon National Park and at Capitol Reef National Park.

† No. of Days > 5% is approximately equivalent to a change of 0.5 deciview and No. of Days > 10% is approximately equivalent to a change of 1.0 deciview.

Table 4.19.11. Cumulative Visibility Results, Alton Coal Tract, Proposed Action, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 8	**Proposed Action, 200-foot Overburden**		
Class I/Class II Area	**2001 Change (%) 8th-high**	**2002 Change (%) 8th-high**	**2003 Change (%) 8th-high**
Bryce Canyon National Park	2.89	5.21	3.50
Capitol Reef National Park	2.80	4.18	4.44
Grand Canyon National Park	1.02	1.26	1.10
Zion National Park	3.18	3.94	3.02
Grand Staircase-Escalante National Monument	2.48	3.41	3.45

Cumulative visibility results for Alternative C are presented in Tables 4.19.12 (Method 6) and 4.19.13 (Method 8). Using Method 6, Capitol Reef National Park impacts exceed the 10% change threshold on one day (maximum of 10.5%). These impacts are due to one of the regional sources (i.e., Dixie Oil Field Development), because the tract-alone impacts at Capitol Reef were small (maximum change of 1.3%). Bryce Canyon National Park also has impacts that exceed the 10% threshold on one day (maximum of 11.1%). Four of the five parks and monuments have visibility extinction changes that surpass 5%, with a maximum of eight days exceeding 5% (at Bryce Canyon National Park). The cumulative visibility results for Method 8 show all parks and monuments with percentage changes below 5%, with the exception of 5.5% in 2002 at Zion National Park.

The tract-alone visibility modeling for Alternative C was performed with VISCREEN. It is likely that the cumulative impacts at Bryce Canyon National Park are attributable to Alton emissions. Based on the results presented in Table 4.3.19, the cumulative impacts at Zion National Park and Grand Canyon National Park are attributable to Alton emissions. At Grand Staircase–Escalante National Monument, approximately 48% of the cumulative impact is attributable to Alton emissions. The remaining portion is attributable to other regional sources.

Table 4.19.12. Cumulative Visibility Results, Alton Coal Tract, Alternative C, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 6*	**Alternative C, 200-foot Overburden**		
Class I/Class II Area	**No. of Days > 5%†**	**No. of Days > 10%†**	**Max. Change (%)**
Bryce Canyon National Park	8 (in 2002)	1 (in 2002)	11.1 (in 2002)
Capitol Reef National Park	4 (in 2003)	1 (in 2001)	10.5 (in 2001)
Grand Canyon National Park	0	0	3.1 (in 2001)
Zion National Park	3 (in 2002)	0	5.9 (in 2002)
Grand Staircase-Escalante National Monument	2 (in 2002, 2003)	0	5.8 (in 2003)

* Method 2 results can be found in the *Supplement to Air Resources Impact Assessment Technical Report for the Alton Coal Lease by Application* in Appendix K. Method 6 results are shown here because they indicate the overall highest impact. One individual max. change % for Method 2 is higher at Bryce Canyon National Park and at Capitol Reef National Park.

† No. of Days > 5% is approximately equivalent to a change of 0.5 deciview and No. of Days > 10% is approximately equivalent to a change of 1.0 deciview.

Table 4.19.13. Cumulative Visibility Results, Alton Coal Tract, Alternative C, 200-foot Overburden Removal (with EC and HNO_3/NO_3 partitioning)

Method 8	**Proposed Action, 200-foot Overburden**		
Class I/Class II Area	**2001 Change (%) 8th-high**	**2002 Change (%) 8th-high**	**2003 Change (%) 8th-high**
Bryce Canyon National Park	3.00	5.47	3.64
Capitol Reef National Park	2.80	4.20	4.44
Grand Canyon National Park	1.02	1.28	1.11
Zion National Park	3.18	3.94	3.02
Grand Staircase-Escalante National Monument	2.48	3.41	3.46

Cumulative visibility results for Alternative K1 would be equal to or less than the results reported in Tables 4.19.10, 4.19.11, 4.19.12, and 4.19.13.

4.19.2.2.6 Deposition

Maximum predicted sulfur and nitrogen deposition impacts were estimated for the cumulative sources (Table 4.19.14). Cumulative visibility results for Alternative K1 would be equal to or less than the results reported below.

Total deposition impacts from direct mine-related and regional sources were compared to the DATs for nitrogen and sulfur in western Class I parks and refuges. All sulfur and nitrogen deposition impacts are below the DATs. The improvements in the cumulative cases versus the Alton cases are due to the large NO_x emission decrease from the Navajo generating station. In fact, the nitrogen deposition values turned out to be 0, signifying that the Navajo emission decrease over the annual period exceeded the increased impacts from other sources. However, based on data from the NPS (as described in Section 3.3.3.3), current total nitrogen deposition at Bryce Canyon National Park is estimated at 2.5 kg/ha/year. This indicates that levels of nitrogen deposition are not 0 at Bryce Canyon National Park, which may be due to sources of deposition that were unforeseen at the time of the DEIS cumulative analysis or to a smaller actual NO_x emission decrease than projected at the Navajo generating station.

Table 4.19.14. Maximum Predicted Sulfur and Nitrogen Deposition Impacts, Alternatives B and C, Cumulative

Location	Overburden Thickness (feet)	Alternative	Cumulative Sources			
			Maximum Dry and Wet Annual Sulfur Deposition (kg/ha/year)	Sulfur DAT for Western Class I Parks and Refuges (kg/ha/year)	Maximum Dry and Wet Annual Nitrogen Deposition (kg/ha/year)	Nitrogen DAT for Western Class I Parks and Refuges (kg/ha/year)
Bryce Canyon	200	B, C	0.0003	0.005	0.0000	0.005
Capitol Reef	200	B, C	0.0007	0.005	0.0000	0.005
Grand Staircase-Escalante	200	B, C	0.0010	0.005	0.0000	0.005
Grand Canyon	200	B, C	0.0001	0.005	0.0000	0.005
Zion	200	B, C	0.0001	0.005	0.0000	0.005
Navajo Lake	200	C	–	–	–	–

4.19.2.3 CLIMATE CHANGE

The human and natural causes of climate change, and the impacts of climate change, are global. GHG emissions, which contribute to climate change, do not remain localized but become mixed with the general composition of the earth's atmosphere. Therefore, this analysis cannot separate the particular contribution of project GHG emissions to global climate change (and its regional implications) from the multitude of other past, present, and reasonably foreseeable projects that have produced or would produce or mitigate GHG emissions. Rather, this analysis focuses on the cumulative impacts of GHG emissions and climate change from a global perspective.

A worldwide environmental issue is the likelihood of changes in the global climate as a consequence of global warming from increasing atmospheric concentrations of GHGs (Intergovernmental Panel on Climate Change [IPCC] 2007a). The atmosphere allows a large percentage of incoming solar radiation to pass through to the earth's surface, where it is converted to heat energy (infrared radiation) that is more readily absorbed by GHGs such as CO_2 and water vapor than by incoming solar radiation. The heat energy absorbed near the earth's surface increases the temperature of air, soil, and water.

GHGs include water vapor, CO_2, CH_4, N_2O, O_3, and several chlorofluorocarbons. GHGs constitute a small percentage of the earth's atmosphere, but are entirely responsible for its heat-trapping properties. Water vapor, a natural component of the atmosphere, is the most abundant GHG, but its atmospheric concentration is driven primarily by changes in the earth's temperature. As such, water vapor simply serves to amplify the effects of other GHGs such as CO_2. The second-most abundant GHG is CO_2, which remains in the atmosphere for long periods of time. Due to human activities, atmospheric CO_2 concentrations have increased by approximately 35% over preindustrial levels. Fossil fuel burning, specifically from power production and transportation, is the primary contributor to increasing concentrations of CO_2 (IPCC 2007a). In the United States, stationary CO_2 emission sources include energy facilities (such as coal and natural gas power plants) and industrial plants. Industrial processes that emit these gases include cement manufacture, limestone and dolomite calcinations, soda ash manufacture and consumption, CO_2 manufacture, and aluminum production (EIA 2009).

In the preindustrial era (before A.D. 1750), the concentration of CO_2 in the atmosphere appears to have been 275–285 ppm (IPCC 2007). In 1958, C.D. Keeling and others began measuring the concentration of atmospheric CO_2 at Mauna Loa in Hawaii (Keeling et al. 1976). The data collected by Keeling's team indicate that the amount of CO_2 in the atmosphere has been steadily increasing from approximately 316 ppm in 1959 to 397 ppm (preliminary data) in 2013 (NOAA 2013). This increase in atmospheric CO_2 is attributed almost entirely to the anthropogenic (e.g., human) activities noted previously. In addition, industrial and agricultural activities release GHGs other than CO_2—notably CH_4, NO_x, O_3, and chlorofluorocarbons—to the atmosphere, where they can remain for long periods of time.

4.19.2.3.1 Impacts of Greenhouse Gases on Climate

Climate is usually defined as the average weather of a region, or more rigorously as the statistical description of a region's weather in terms of the means and variability of relevant parameters over time periods ranging from months to thousands of years. The relevant parameters include temperature, precipitation, wind, and dates of meteorological events such as first and last frosts, beginning and end of rainy seasons, and appearance and disappearance of pack ice. Because GHGs in the atmosphere absorb energy that would otherwise radiate into space, the possibility that human-caused emissions of these gases could result in warming that might eventually alter climate was recognized soon after the data from Mauna Loa and elsewhere confirmed that the atmosphere's content of CO_2 was steadily increasing (IPCC 2007a; NOAA 2010).

Changes in climate are difficult to detect because of the natural and complex variability in meteorological patterns over long periods of time and across broad geographical regions[13]. There is uncertainty regarding the extent of global warming caused by human-caused GHGs, the climate changes this warming has or will produce, and the appropriate strategies for stabilizing the concentrations of GHGs in the atmosphere. The World Meteorological Organization and United Nations Environment Programme established the IPCC to provide an objective source of information about global warming and climate change, and IPCC's reports are generally considered to be an authoritative source of information on these issues.

According to the IPCC fourth assessment report, "[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC 2007b). The IPCC report finds that the global average surface temperature has increased by approximately 0.74 degrees Celsius in the last 100 years; global average sea level has risen approximately 150 millimeters over the same period; and cold days, cold nights, and frosts over most land areas have become less frequent during the past 50 years. The report concludes that most of the temperature increases since the middle of the twentieth century "is [are] very likely due to the observed increase in anthropogenic [GHG] concentrations."

[13] Detection of these types of changes was also difficult because of the limited tools that were available for collecting data and for modeling climate systems. However, scientific advances over the last 20 years have vastly improved the tools available for climatological research.

The 2007 report estimates that CO_2 accounts for approximately 77% of the GWP attributable to human-caused releases of GHGs, with most (74%) of this CO_2 coming from the combustion of fossil fuels. Although the report considers a variety of future scenarios regarding GHG emissions, CO_2 would continue to contribute more than 70% of the total warming potential under all scenarios. IPCC therefore believes that further warming is inevitable, but that this warming and its effects on climate could be mitigated by stabilizing the atmosphere's concentration of CO_2 through the use of 1) "low-carbon technologies" for power production and industrial processes, 2) more efficient use of energy, and 3) management of terrestrial ecosystems to capture atmospheric CO_2 (IPCC 2007b).

4.19.2.3.2 Environmental Impacts of Climate Changes

IPCC and the U.S. Climate Change Science Program have examined the potential environmental impacts of climate change at global, national, and regional scales. The IPCC report states that, in addition to increases in global surface temperatures, the impacts of climate change on the global environment may include

- more frequent heat waves, droughts, and fires;
- rising sea levels and coastal flooding;
- melting glaciers, ice caps, and polar ice sheets;
- more severe hurricane activity and increases in frequency and intensity of severe precipitation;
- spread of infectious diseases to new regions;
- loss of wildlife habitats; and
- heart and respiratory ailments from higher concentrations of ground-level O_3 (IPCC 2007b).

Socioeconomic impacts from climate change vary by region and locality but are expected to involve food, water, health, coastal regions, and industry, settlements, and society (IPCC 2007b). Socioeconomic costs may result from changes in crop productivity; reduced water availability, flooding, and increased drought; increases in malnutrition and deaths, diseases, and injuries; and rising sea levels and increasing coastal erosion. The most vulnerable industries, settlements, and societies are generally those in coastal and river floodplains, those whose economies are closely linked with climate-sensitive resources, and those in areas prone to extreme weather events. Poor communities may be especially vulnerable (IPCC 2007b).

On a national scale, average surface temperatures in the United States have increased, with the last decade being the warmest in more than a century of direct observations (CCSP 2008). Impacts on the environment attributed to climate change that have been observed in North America include

- extended periods of high fire risk and large increases in burned areas;
- increased intensity, duration, and frequency of heat waves;
- decreased snowpack, increased winter and early spring flooding potentials, and reduced summer stream flows in the western mountains; and
- increased stress on biological communities and habitat in coastal areas (IPCC 2007b).

On a regional scale, there is greater natural variability in climate parameters that makes it difficult to attribute particular environmental impacts to climate change (IPCC 2007b). However, based on observational evidence, there is likely to be an increasing degree of impacts such as coral reef bleaching, loss of specific wildlife habitats, reductions in the area of certain ecosystems, and smaller yields of major cereal crops in the tropics (IPCC 2007b). For the northern hemisphere, regional climate change could affect physical and biological systems, agriculture, forests, and amounts of allergenic pollens (IPCC 2007b)[14].

[14] The IPCC report provides more detailed information on the current and potential environmental impacts of climate change and on how climate may change in the future under various scenarios of GHG emissions.

4.19.2.3.3 Production of Greenhouse Gases

Emissions of GHGs from the tract would increase the atmosphere's concentration of GHGs, and in combination with past and future emissions from all other sources, they would contribute incrementally to the global warming that produces the adverse effects of climate change described previously. At present, however, the climate change research community has not yet developed tools specifically intended for evaluating or quantifying end-point impacts attributable to the emissions of GHGs from a single source. The current tools for simulating climate change generally focus on global- and regional-scale modeling. Global- and regional-scale models lack the capability to represent many important small-scale processes. As a result, confidence in regional- and subregional-scale projections is lower than at the global scale. Therefore, there is no methodology that would allow the BLM to estimate the specific impacts (if any) that this increment of warming or climate change would produce on the tract or elsewhere.

4.19.2.4 CULTURAL RESOURCES

The CIAA for cultural resources is the tract, the Coal Hollow Mine, the potential fee coal mine north of the tract, the Panguitch Historic District, and the Utah Heritage Highway (Map 4.8). Mining activity in these areas is an RFFA that, in conjunction with the Proposed Action, Alternative C, and Alternative K1 analyzed in this EIS, would lead to a broader pattern of impacts to cultural resources in the Alton Amphitheatre and Sink Valley area. There are no other RFFAs identified in the KFO RMP that have the potential to affect archaeological sites in this area. For the Panguitch Historic District and the Utah Heritage Highway 89/Mormon Pioneer Heritage Area, the cumulative impacts analysis considers the anticipated expansion of US-89, the only RFFA identified in the KFO RMP that has the potential to affect these resources.

Ongoing activities in the fee coal areas adjacent to the Alton Coal Tract include surface mining and the construction of facilities. Four archaeological sites that would not be affected by mining in the Alton Coal Tract have been identified in the portion of the Coal Hollow Mine area in which surface mining is currently occurring (as of 2014) (an additional six sites that have been identified in the potential surface mining area straddle the border between the Coal Hollow Mine and the Alton Coal Tract and are included in the analysis of impacts for the Proposed Action, Alternative C, and Alternative K1). Of these, two are NRHP-eligible prehistoric sites, one is an NRHP-eligible multicomponent site, and one is a prehistoric site that is not eligible for the NRHP. There is one archaeological site that has been identified in the potential fee coal area to the north of the tract that occurs in an area where surface mining may occur (this is in addition to two sites that straddle the border between the potential fee coal area and the tract that were considered in the analysis of impacts in the tract). This is an NRHP-eligible prehistoric site. Thus, surface mining in the fee coal areas may impact five sites, four of which are NRHP-eligible, in addition to those that would be affected by the Proposed Action. Impacts of surface mining in the fee coal areas can be expected to be similar to those of surface mining in the tract and would likely result in complete destruction of these sites.

Another three archaeological sites have been identified in the portion of the Coal Hollow Mine in which surface mining will not occur (in addition to two sites in the area where surface mining will not occur that straddle the border between the Coal Hollow Mine and the Alton Coal Tract and are included in the analysis of impacts in the tract). These are all NRHP-eligible prehistoric sites. These sites may be impacted by activities associated with mining, such as facilities construction.

Overall, ongoing and reasonably foreseeable activities in the fee coal areas will incrementally add to the impacts to archaeological sites that would occur under the Proposed Action, Alternative C, or Alternative K1 for the Alton Coal Tract.

Regarding the Panguitch Historic District and the Utah Heritage Highway 89/Mormon Pioneer Heritage Area, according to the KFO RMP (BLM 2008b), it is anticipated that US-89 will be widened over the next 20 years to allow for an increase in traffic volume. The increased truck traffic that would occur under the Proposed Action, Alternative C, or Alternative K1 for the life of the mine would contribute to the increased traffic volume that is already expected to occur on US-89. Overall, it can be expected that truck traffic associated with mining in the Alton Amphitheatre and Sink Valley area would contribute to a broader pattern of increased traffic volume along US-89 that will likely occur over the next two to three decades. To the extent that increased traffic has impacts on the integrity of setting, feeling, and association of the Panguitch Historic District and the Utah Heritage Highway 89, coal truck traffic would contribute to an even broader pattern of such impacts. For a further discussion of cumulative impacts related to US-89, see the Transportation section below (Section 4.19.2.14).

Finally, in the broader CIAA (the BLM-KFO), any increase in surface-disturbing activities would increase the potential to adversely impact known and currently unknown archaeological sites. With the implementation of the Proposed Action, Alternative C, or Alternative K1, there would be a 2.6%, 2.2%, and a 1.3% increase, respectively, in surface disturbance in the entire CIAA over the next 20 years.

4.19.2.5 FIRE MANAGEMENT

The CIAA for fire management is the BLM-KFO and the reasonably foreseeable coal haul transportation route (Map 4.6). As mineral development, recreational activities, and general use of the area increase, so would the number of potential ignition sources and consequently the probability of wildland fire occurrence. Activities associated with fire suppression, recreation, development, and general land use would cumulatively contribute to the modification of the composition and structure of vegetation communities and increase the spread of noxious and invasive weeds. Such effects would, in turn, alter the fire regime of the area, potentially increasing the frequency, size, and intensity of wildland fires. Developed areas and associated roads and ROW corridors could also provide increased accessibility to remote areas for fire suppression equipment and provide fuel breaks in the case of wildland fire events. The RFD in the CIAA would impact 75,815 acres. Of these acres, approximately 3,476 acres would be from wildfire, 390 acres would be from wildfire use, and 800 acres would be from prescribed fire. Most (79%) of the reasonably foreseeable surface disturbance in the CIAA would be from vegetation treatments (60,000 acres). The Proposed Action would increase surface disturbance, as well as potential fire management actions, by 2.6%, Alternative C would increase the total disturbance by 2.2% in the CIAA, and Alternative K1 would increase total disturbance by 1.3% in the CIAA.

4.19.2.6 GEOLOGY AND MINERALS

The CIAA for geology and minerals is the BLM-KFO (Map 4.6). Past and present actions include two mining operations in the Alton Coal Field, both on private lands for fee coal, resulting in the extraction of approximately 13 million tons of coal from the Alton Coal Field (estimated tons assume that acre-for-acre coal tonnage is approximately the same on the private tracts as on the tract). In addition to the Alton Coal Field, there are two other major coal fields (Kaiparowits and Kolob) in the CIAA. No coal mining activities are currently occurring or are reasonably foreseeable in these coal fields.

Reasonably foreseeable mineral development in the CIAA includes oil and gas development, coalbed CH_4 extraction, locatable mineral development, and salable mineral development. RFFAs in the CIAA could impact up to 75,815 surface acres. Of these acres, approximately 4,404 acres (5.8%) would be from mining, coalbed CH_4 extraction, oil and gas exploration/development/production, and associated activities.

Under the Proposed Action, Alternative C, or Alternative K1, 44.9 million tons, 38.1 million tons, or 30.0 million tons, respectively, of coal would be permanently removed from the Alton Coal Field. This would be a 29%, 26%, or 20% increase, respectively, in the amount of coal removed from the coal field when considered with reasonably foreseeable coal mining activities. Under the Proposed Action, the Alton Coal Tract would directly impact 1,993 acres, which is a 2.6% increase in the total surface disturbance in the CIAA over the next 20 years. Alternative C would directly impact 1,662 acres, which is a 2.2% increase in the total surface disturbance in the CIAA. Alternative K1 would directly impact 1,012 acres, which is a 1.3% increase in the total surface disturbance in the CIAA. Various forms of surface disturbance impact geological resources by potentially altering surface and subsurface features, modifying stratigraphic layers, resulting in potential geologic hazards, etc. Pursuant to an Exploration Agreement and Option to Lease between ACD and SITLA, exploration and possible underground coal mining operations in Kane County could result in a maximum of approximately 1,255 acres of subsidence impacts. The level of subsidence generally depends on the thickness of the coal extracted and the thickness of the overburden, as well as other geological factors. These mining operations and the resulting subsidence would impact the geological resources of the area mined. At this time, there are not enough details known about these potential mining activities to estimate the level of subsidence that would result. The geological impacts from underground mining and subsidence would add incrementally to the cumulative geological impacts of other mining activities in the CIAA.

The Alton Coal Tract is in a high potential area for oil and gas. Assuming that coal mining on the tract would preclude all oil and gas development over the life of the mine, the mining activities associated with the Alton Coal Tract under the Proposed Action, Alternative C, or Alternative K1 would decrease impacts to oil and gas resources because their extraction would be postponed to allow for coal mining. On the other hand, impacts to locatable minerals (namely septarian nodules) and salable minerals (largely burnt shale and gravel) would be incrementally increased as a result of coal mining activities under the Proposed Action, Alternative C, or Alternative K1, depending on how their unearthing was dealt with during the mining process (i.e., if the gravel is separated from the overburden). If these materials were returned to mined-out pits along with the remainder of overburden, they would remain in-place following mining, and no extraction-related impact would occur. On the other hand, if these materials were to be set aside and sold, the mining operation would result in increased impacts to these resources in the CIAA via extraction and sale.

4.19.2.7 HAZARDOUS MATERIALS AND HAZARDOUS AND SOLID WASTE

The CIAA for hazardous materials and hazardous and solid waste is the BLM-KFO and the reasonably foreseeable coal haul transportation route (Map 4.6). The State of Utah is considering an application to surface mine privately owned coal resources adjacent to the tract in Kane County. Resource decisions from this project could combine with other past, present, and RFFAs to produce cumulative impacts from hazardous materials and solid waste in the CIAA. Additional opportunities for incidences related to hazardous materials in the CIAA include oil and gas development and transport, prescribed fire treatments, and to a lesser extent the installation of transmission lines and pipelines. Of the approximately 75,815 acres of total surface disturbance from RFFAs in the CIAA, there are approximately 2,070 acres (2.7%) of oil and gas exploration, development, and production. There are approximately 800 acres (1%) of prescribed fire treatments in the CIAA. With adherence to SOPs, cumulative impacts in the CIAA would be minimal.

4.19.2.8 LAND USE AND ACCESS

The CIAA for land use and access is the BLM-KFO (Map 4.6). Cumulative impacts to land use and access could occur from a combination of land uses and permitted actions. Past and present actions in the CIAA have resulted in the current conditions for land use and access as described in Section 3.8. RFFAs in the CIAA could impact up to 75,815 surface acres. This is a conservative estimate because all of the 75,815 acres of surface disturbance may not affect land use and access. These include the conversion of agricultural lands to residential and commercial uses and known projects such as the Coal Hollow environmental assessment (which occurs on lands adjacent to and including the Alton Coal Tract), the Lake Powell water pipeline project, and the US-89 highway widening project. Under the Proposed Action, the Alton Coal Tract would take up 3,576 acres, which is a 4.7% increase in the total acres disturbed in the CIAA over the next 25 years. Alternative C would take up 3,173 acres, which is a 4.2% increase in the total acres disturbed in the CIAA over the next 20 years. Alternative K1 would take up 2,114 acres, which is a 2.8% increase in the total acres disturbed in the CIAA over the next 16 years.

Land tenure on the tract would not change based on any known past, present, or reasonably foreseeable projects. The land status and prior rights currently held by parties would remain unchanged. However, the overall land use in the tract would be restricted to mining operations. The mine operator would lease federal surface estate and federal mineral estates from the BLM for the life of the mine and until the coal mine area has been reclaimed and released from bond. In addition, as necessary, the mine operator would negotiate surface use agreements with qualified surface owners in the tract prior to any mine activity taking place.

Using total tract acres as an indicator of land use in the CIAA, mining operations on the Alton Coal Tract would increase the total acreage of land in the CIAA used for mineral extraction by 3,576 acres under the Proposed Action, 3,173 acres under Alternative C, and 2,114 acres under Alternative K1. RFFAs would result in the use of 5,659 acres of land for mineral extraction–related activities. Coal mining activities on the tract under the Proposed Action would result in an 81.2% increase in the acreage of land in the CIAA used for mineral extraction. Coal mining activities on the tract under the Alternative C would result in a 72.0% increase in the acreage of land in the CIAA used for mineral extraction. Coal mining activities on the tract under Alternative K1 would result in a 48.0% increase in the acreage of land in the CIAA used for mineral extraction. Under each of the action alternatives, the amount of land used for mineral extraction across the CIAA (again using overall tract acres as an indicator) would still be relatively low at 4.7%, 4.2%, and 2.8%, respectively.

4.19.2.9 LIVESTOCK GRAZING

The CIAA for livestock grazing is the BLM-KFO (Map 4.6). Potential cumulative impacts on livestock grazing operations could occur from a combination of activities and land uses occurring in the CIAA. Vegetation treatments and range improvements on lands adjacent to the tract (public and private) would increase available forage and water for a wide range of uses, including livestock grazing and rangeland health. Surface-disturbing activities, including coal development activities and related construction of roads and infrastructure, could be a primary cause of site-specific loss of forage and the spread of noxious weeds.

Past and present actions in the CIAA have resulted in the current conditions for livestock grazing as described in Section 3.9. RFFAs in the CIAA could impact up to 75,815 surface acres. Under the Proposed Action, the Alton Coal Tract would take up 3,576 acres, which is a 4.7% increase in the total acres disturbed in the CIAA over the next 20 years. Alternative C would take up 3,173 acres, which is a 4.2% increase in the total acres disturbed in the CIAA. Alternative K1 would take up 2,114 acres, which is a 2.8% increase in the total acres disturbed in the CIAA.

The implementation of BLM’s mitigation guidelines, restrictions on surface use, standards for rangeland health, vegetation treatments, and monitoring efforts would all provide measures of protection for forage resources on federal lands, which would help to reduce overall cumulative impacts on livestock grazing operations.

4.19.2.10 PALEONTOLOGY

The CIAA for paleontology is the BLM-KFO (Map 4.6). It is likely that intense hobby fossil collecting and other nearby mining activities for burnt shale clinker and septarian concretions would continue through the life of the mine under the Proposed Action, Alternative C, or Alternative K1. It is also expected that research activities in the Alton Amphitheatre would increase as knowledge of the nearby Kaiparowits Basin matures, creating additional demands for undisturbed fossils and outcrops. The mining of burnt shale, septarian concretions, or nearby coal resources would contribute to the total loss of fossil resources on federal lands, perhaps as much as an additional 40%.

Across the CIAA, RFFAs would result in approximately 75,815 acres of surface disturbance. However, approximately 60,000 acres (79%) of the total surface disturbance would be from vegetation treatments, which have less potential for impacting deeply buried fossils than subsurface activities such as mining and oil and gas exploration and development. Surface-disturbing activities have the potential to result in the destruction of fossils depending on the location of the surface-disturbing activity. On the other hand, surface-disturbing activities can also result in the unearthing of fossils and their inclusion in the paleontological scientific body of knowledge. Mining operations on the tract under the Proposed Action, Alternative C, or Alternative K1 would result in surface disturbance of 1,993, 1,662, and 1,012 acres, respectively. This would represent a 2.6%, 2.2%, or 1.3% increase, respectively, in surface disturbance in the CIAA.

4.19.2.11 RECREATION

The CIAA for recreation is the BLM-KFO and the reasonably foreseeable coal haul transportation route (Map 4.6). Cumulative impacts to recreation resources could occur from a combination of land uses and permitted actions. These include the conversion of agricultural lands to residential and commercial uses and known projects such as the Coal Hollow environmental assessment (which occurs on lands adjacent to and including the Alton Coal Tract), the Tropic to Hatch transmission line project, the Lake Powell water pipeline project, the Jackson Flat Reservoir project, and the US-89 highway widening project.

Past and present actions in the CIAA have resulted in the current conditions available for recreation as described in Section 3.8. RFFAs in the CIAA could impact up to 75,815 surface acres. Under the Proposed Action, the Alton Coal Tract would take up 3,576 acres, which is a 4.7% increase in the total acres removed from potential recreation use in the CIAA over the next 20 years. Alternative C would take up 3,173 acres, which is a 4.2% increase in the total acres removed from potential recreation use in the CIAA. Alternative K1 would take up 2,114 acres, which is a 2.8% increase in the total acres removed from potential recreation use in the CIAA.

This cumulative loss of lands available would impact recreation opportunities by removing lands currently available for recreation pursuits. The conversion of undeveloped land to residential, commercial, and industrial uses is likely the largest area of impact to recreation resources in the CIAA. As removal of minimally developed land available for hunting and dispersed recreation increases, the amount of land available for recreation in those types of settings decreases permanently, displacing existing recreation use to other available lands. Users would move onto adjacent public lands (BLM-administered lands and the Dixie National Forest) for hunting and other dispersed recreation opportunities (camping, hiking, sightseeing, etc.). This would increase crowding and decrease the recreational experiences of displaced and existing users in those remaining areas.

4.19.2.12 SOCIOECONOMICS

The CIAA for socioeconomics is Kane, Garfield, and Iron counties (Map 4.6). Thus, in addition to considering the past, present, and reasonably future impacts from the KFO (Kane and Garfield counties), the cumulative socioeconomic analysis considers management decisions related to the Cedar City Field Office (Iron County) as well. Most of the cumulative impacts to the social and economic conditions of the three-county area would be a result of mineral development.

In Kane County, the Coal Hollow Mine currently in operation adjacent to the tract employs 34 staff at coal production levels between 400,000 and 500,000 TPY. This ratio of production level to employment equates to 160 mine employees at 2 million tons of production (ACD 2013). According to the Utah Geologic Survey, two coal fields exist in Iron County (Harmony and Kolob) (UDNR 2006). However, development of these fields is not anticipated in the foreseeable future. Because there is no current or reasonably foreseeable coal production or oil and gas development in Iron and Beaver counties, the Proposed Action, Alternative C, or Alternative K1 would add a new revenue stream, by indirect expenditures, into the local economy. The Proposed Action, Alternative C, or Alternative K1 could contribute to revenues from existing and future oil and gas development and exploration in the KFO. The KFO estimates that 90 oil and gas wells will be drilled over a 20-year period. An increased contribution of mineral-related royalties, taxes, and payments from the successful bidder to the federal, state, and local government would be beneficial to current economic conditions at all levels of government. As stated in the KFO RMP (BLM 2008b), the Alton coal mine "would provide by far the largest new economic stimulus to the [Kane and Garfield counties]."

Increasing natural resource development in the KFO and potentially in the Cedar City Field Office over the next 20 years would likely alter the social character in many of the small central and southern Utah communities. In addition to the truck traffic required to move mined coal to market, other production-related trucks would further degrade the rural, small-town nature of communities near mines, wells, and along transportation routes. The alteration of landscapes from semiprimitive/natural to ones characterized by coal mining and oil and gas development would be experienced by local residents in the area who enjoy and/or depend on the naturalness of the area for their livelihood. Alton, an EJ community, could experience further disproportionate adverse impacts from the combined effect of reasonable foreseeable future mining on the northern private fee area, the Coal Hollow Mine, and mining in Block NW under the Proposed Action (but not Alternatives C or K1). Cumulatively, these changes could also result in adverse impacts to recreationists who value primitive recreation and businesses dependent on tourism-related revenue.

4.19.2.13 SOILS

The CIAA for soils is the BLM-KFO (Map 4.6). In addition to the 1,993 acres, 1,662 acres, and 1,012 acres of soil disturbance that would occur under the Proposed Action, Alternative C, and Alternative K1, respectively, several other activities would impact soils in the CIAA. The RFFAs in the CIAA would disturb 75,815 surface acres (see Table 4.19.1). The Proposed Action would increase surface disturbance in the CIAA by 2.6%, Alternative C would increase the total disturbance by 2.2%, and Alternative K1 would increase surface disturbance by 1.3% in the CIAA.

Proposed coal mine development on private surface areas adjacent to the Alton Coal Tract would result in an additional 802 acres of surface disturbance to soils, potentially contributing to soil erosion and loss of soil productivity. Other activities could also contribute to cumulative impacts to soil in the CIAA, including OHV and vehicle use, rangeland use, oil and gas development, and other surface uses and activities. Under the KFO RMP, the public lands in the CIAA limit OHV use to designated trails and roads, and the area is open to oil and gas leasing. All oil and gas development, mining, public lands grazing, and other uses of public lands would require permits that would comply with authorizing permit stipulations and apply BMPs that would minimize the overall erosion and loss of soil productivity resulting from incremental impacts. Thus, the mining of the Alton Coal Tract and adjacent private lands would be one of the dominant cumulative impacts to soils in the CIAA.

4.19.2.14 TRANSPORTATION

The CIAA for transportation is the reasonably foreseeable coal haul transportation route (Map 4.7). Cumulative impacts to transportation could occur from a combination of land uses and permitted actions. Past and present actions have contributed to the existing LOS in the area of analysis. These include the use of an existing transportation route (US-89 to SR-20 to I-15 to Iron Springs along U.S. Route 56 for transporting coal from the Coal Hollow Mine to market), and tourist traffic associated with improved recreational opportunities in the region. Future actions that would contribute to cumulative impacts to transportation include expanding US-89, oil and gas development, locatable mineral development, salable mineral development, energy corridor development, wind energy development, and water projects.

The Proposed Action, Alternative C, or Alternative K1 would all cause incremental increases in traffic density; however, none would result in substantial decreases to LOS. Under the Proposed Action, the Alton Coal Tract would continue to contribute to increased traffic levels on surface roads in the CIAA over the next 25 years. Alternative C would contribute increased traffic levels in the CIAA for the next 20 years. Alternative K1 would contribute increased traffic levels in the CIAA for the next 16 years. The expansion of US-89 is expected to improve LOS on portions of the coal haul transportation route and would mitigate the incremental increases in traffic density resulting from the Proposed Action, Alternative C, or Alternative K1.

4.19.2.15 VEGETATION

The CIAA for vegetation is the BLM-KFO (see Map 4.6). Past fire suppression has contributed to increasing pinyon-juniper encroachment in the CIAA, as well as a concurrent decrease in aspen and ponderosa pine communities. Current fire use and vegetation treatments would generally maintain or improve vegetation communities by removing undesired species, increasing species diversity and age class, improving vegetation composition and structure, and increasing vegetation cover. Minerals development, such as copper and uranium mining, has occurred across this region in the past. The spatial layout of oil and gas facilities and access roads also disturbs a large proportion of vegetation when considered across the landscape. Each disturbed area increases the opportunity for weed invasions and disrupts the spatial continuity of vegetation communities. The combined amount of surface disturbance of these past and present actions is detrimental to vegetation resources.

The overall cumulative impact of activities proposed for all resource decisions on vegetation resources in the CIAA includes short-term detrimental impacts and long-term improvements. Major contributors to detrimental impacts include continuing or increasing OHV activities throughout most of the area, and degradation to vegetation and habitats from mineral development–related activities. However, of the estimated 75,815 acres of surface disturbance as a result of RFFAs in the CIAA, approximately 60,000 acres (or 79% of the total 75,815 acres) are anticipated to be for vegetation treatments intended to create desired vegetation communities such as stable sagebrush stands. An additional 4,666 acres of disturbance would be a result of wildfire, wildfire use, and prescribed fire. Although impacts related to fire are adverse to vegetation in the short term, in the long term, fire results in beneficial impacts to vegetation by culling out decadent and decaying plant material and returning vegetation communities to historical fire return intervals that promote vegetation community vigor.

Resource decisions from mining activities on the tract under the Proposed Action or Alternative C would combine with other past, present, and RFFAs to produce cumulative impacts to vegetation resources in the CIAA. Past and present actions in the CIAA have resulted in the current vegetation conditions as described in Section 3.15. The Proposed Action would disturb 1,993 surface acres, a 2.6% increase in surface disturbance in the CIAA. Alternative C would disturb 1,662 acres, a 2.2% increase in total CIAA surface disturbance. Alternative K1 would disturb 1,012 acres, a 1.3% increase in total CIAA surface disturbance. Surface disturbance associated with consumptive uses such as oil, gas, and other minerals development, and forage use by livestock and wildlife species would result in cumulative impacts over a larger landscape scale than analyzed in this document.

Though coal mining activities on the Alton Coal Tract would result in short-term adverse impacts to vegetation as described, in the long term, reclamation activities would restore native and suitable non-native plants to the landscape in arrangements beneficial to the vegetation communities themselves and to the wildlife that depend on these communities for habitat.

4.19.2.16 WATER RESOURCES

The CIAA for water resources is the BLM-KFO (see Map 4.6). Past and present activities in the CIAA that have resulted in the current conditions for water resources as described in Section 3.16 include mineral development, transmission projects, road construction, rerouting and improvements, OHV use, and grazing. RFFAs that would result in incremental impacts associated with localized erosion and sediment loading that could degrade downstream water quality include the northern private coal area, construction and development of the Lake Powell pipeline, development of the West-wide Energy Corridor, and oil and gas development. RFFAs in the CIAA, which have the potential to impact water resources, would impact approximately 75,815 acres. The Proposed Action would increase surface disturbance, and could increase adverse impacts to water quality and/or quantity, by 2.6%, Alternative C would increase the total disturbance by 2.2%, and Alternative K1 would increase the total disturbance by 1.3% in the CIAA.

However, projects occurring on BLM-administered land must comply with BLM-permitted activities and would comply with permit stipulations that would minimize soil erosion and degradation of water quality and quantity. These permitted activities are not expected to contribute to the overall cumulative impact to water quality and quantity from past, present, and reasonably foreseeable actions.

Several actions identified by the BLM as reasonably foreseeable actions, such as fire use and vegetation treatments, would incrementally improve watershed health in the long term, though short-term impacts on water quality from these activities would be adverse.

Pursuant to an Exploration Agreement and Option to Lease between ACD and SITLA, exploration and possible underground coal mining operations in Kane County could result in a maximum of approximately 1,255 acres of subsidence impacts. The level of subsidence generally depends on the thickness of the coal extracted and the thickness of the overburden, as well as other geological factors. These mining operations and the resulting subsidence have the potential to impact water resources in the area mined, if any water resources are present. At this time, there are not enough details known about these potential mining activities to estimate the level of subsidence that would result. Underground mining and subsidence on the tract would add approximately 62.1% to the cumulative water resource impacts of mining activities associated with mining the SITLA coal.

The Coal Hollow Mine is adjacent to the tract and is currently in operation. The total acreage of the Coal Hollow Mine permit is 424 acres. Mining at the Coal Hollow Mine began in late 2010 and mining activities are ongoing as of early 2014.

The results of water monitoring activities at the Coal Hollow Mine have not indicated unexpected impacts to the quality or quantity of water resources surrounding the mine area. Discharge rates in springs and streams continue at rates similar to those observed prior to mining. The water quality of groundwaters and surface-waters is also generally similar to pre-mining conditions. As anticipated, where the mine pits have been excavated, alluvial groundwaters present in the overburden above pit areas have been removed together with the overburden as mining has progressed. Similarly, as anticipated, water levels in the Smirl

Coal Zone in and near mine pit areas have declined in response to the removal of the coal. Alluvial groundwater levels and spring discharge rates near the groundwater production well in Sink Valley (which pumps at approximately 50 gpm for mine operational use) remain at levels similar to those measured before mining activity began.

The rates at which groundwater has been intercepted by the mine pits have not been large, averaging less than approximately 20 gpm inflow to the mine from all groundwater sources (ACD 2009). Some of the groundwater intercepted within the mine pits is used for dust suppression activities. Consequently, discharge of water from the Coal Hollow Mine has been infrequent, with no discharges occurring in the previous two years (2012–2013). As discussed in Section 4.16.4.1, discharges of water from the Coal Hollow Mine have occurred on a few occasions where the total iron or total suspended sediments concentrations exceeded the UPDES effluent limitations. However, UPDES discharges of water from the mine have been infrequent, and the discharge rates have ranged from 1.3 gpm to 15 gpm.

It is anticipated that the effects on water resources resulting from future mining at the Coal Hollow Mine would be generally similar to those experienced previously at the mine. Similarly, assuming that a future coal mine within the tract would be operated in a manner similar to the Coal Hollow Mine, similar incremental effects to water resources in the tract area would be anticipated.

Probable AVFs have been identified along Kanab Creek upstream and downstream of the tract area. A probable AVF has also been identified in Sink Valley wash below the tract area. These areas have been determined to be probable AVFs based primarily on their relatively flat landforms and the possible availability of water in streams for irrigation use (Petersen Hydrologic 2008). No impacts to the water supplies of the probable AVFs have occurred from mining operations at the Coal Hollow Mine. Impacts to the water supplies of these probable AVFs are not expected from proposed mining activities in the tract.

4.19.2.17 WILDLIFE: GENERAL

The CIAA for general wildlife species comprises the BLM-KFO (Map 4.6). The current environmental condition of the wildlife habitat on the tract is described in Sections 3.17 and 3.18. These conditions have occurred as a result of past and present actions in the CIAA. Past and present activities that impact wildlife in the CIAA include activities such as mineral development, energy projects (e.g., transmission lines), water projects (e.g., pipelines), highway construction and road improvement projects, vegetation treatments, OHV use, and range improvements. These activities impact wildlife through the long-term removal and short-term degradation of habitat, as well as habitat fragmentation and increased human-induced disturbances. Present vegetation treatments consist of those associated with the adjacent Coal Hollow Mine, as well as 26,996 acres of treatments completed by the BLM in the areas assessed by the *Upper Kanab Creek Watershed Vegetation Management Project Environmental Assessment* (BLM 2010d) and the *South Canyon Vegetation Enhancement Environmental Assessment* (BLM 2010c) (see Map 3.23). These vegetation treatments consist of removing conifer trees that have encroached upon sagebrush habitat. The treatments are detrimental to species that use conifer habitats (e.g., Sharp-shinned Hawk, Cooper's Hawk, and Pinyon Jay). However, these vegetation treatments are beneficial for species that use sagebrush habitat for all or part of its lifecycle (e.g., many big game species, Sage Sparrow, Sage Thrasher).

RFFAs that could impact wildlife in the CIAA include ongoing and increasing mineral development, ongoing energy projects, road improvement projects, ongoing and increasing OHV use, increased vegetation treatments, and increased range improvements, which would have the same nature of impacts as described in Section 4.17.4.2. RFFAs in the CIAA, which have the potential to impact wildlife, would impact approximately 75,815 acres. Additionally, pursuant to an Exploration Agreement and Option to

Lease between ACD and SITLA, exploration and possible underground coal mining operations in Kane County could result in a maximum of approximately 1,255 acres of subsidence impacts. The level of subsidence generally depends on the thickness of the coal extracted and the thickness of the overburden, as well as other geological factors. These mining operations are not likely to affect wildlife directly, but may adversely affect wildlife if any water resources that wildlife relies on decrease in volume due to subsidence. Additionally, direct or indirect impacts to wildlife and their habitats would occur from collapse of surface topography, such as rock walls or cliffs, resulting in a potential loss of nesting or roosting habitat. At this time, there are not enough details known about these potential mining activities to estimate the level of subsidence that would result. The potential impact on wildlife from underground mining and subsidence would generally be small when compared to potential impacts from surface mining, but would add incrementally to the cumulative disturbance to wildlife from other mining activities in the CIAA.

The overall cumulative impact of activities proposed for the Alton Coal Tract and surrounding planning areas on wildlife includes short-term detrimental impacts and long-term improvements to habitats that are degraded from conifer encroachment before mining begins. Surface disturbance associated with oil, gas, and other minerals development, and forage use by livestock, would result in cumulative impacts over a larger area than is analyzed in this document. The combined surface disturbance of past, present, and reasonably foreseeable future development would be detrimental to wildlife due to fragmentation and destruction of habitat. Detrimental impacts include ongoing or increasing OHV use, loss and degradation of habitat due to mineral development, and disruption of daily and seasonal animal movement and habitat use due to increased human presence, increased traffic volume and speeds, and noise and light pollution. Each disturbed area increases habitat fragmentation, reduces the connectivity and integrity of habitats, and displaces wildlife over the short and long term. The nature of these impacts on wildlife is also described in Section 4.17.4.2.

The Proposed Action would increase total surface disturbance in the CIAA by 2.6% (1,993 acres). Alternative C would increase the total surface disturbance by 2.2% (1,662 acres) in the CIAA. Alternative K1 would increase the total surface disturbance by 1.3% (1,012 acres) in the CIAA. These increases in total surface disturbance also have the potential to adversely impact wildlife in the CIAA in the ways described in Section 4.17.4.2.

Furthermore, the Proposed Action would increase existing traffic rates on the reasonably foreseeable coal haul transportation route by 4% (including a 33% increase in heavy truck traffic) for 25 years. Impacts due to coal hauling from Alternative C and K1 would be identical to the Proposed Action, except the impacts would occur over a 21-year period and 16-year period, respectively. Impacts from coal hauling that would contribute cumulatively to past, present, and reasonably foreseeable impacts consist of increased potential for mortality due to collisions with vehicles, disruptions in typical wildlife habitat use and migratory patterns due to the barrier effect of heavily used roads, increased raptor activity due to carrion increasing predation pressures on adjacent prey species, and the population-level impacts resulting from these impacts. Transportation impacts are described in greater detail in Section 4.17.5.

4.19.2.18 WILDLIFE: SPECIAL STATUS SPECIES

The CIAA for all special status wildlife species except Greater Sage-Grouse consists of the BLM-KFO (Map 4.6). The Greater Sage-Grouse CIAA is identical to the Greater Sage-Grouse analysis area, as portrayed on Map 3.21. Cumulative impacts on special status wildlife species would be the same as those described for other wildlife (Section 4.19.3.17), with the following additions and clarifications.

4.19.2.18.1 Utah Prairie Dog

The Utah prairie dog does not occur in the tract, but occurs along approximately 50 miles (42%) of the reasonably foreseeable coal haul transportation route (see Section 3.18.2.2). Past and present activities that impact the Utah prairie dog in the CIAA consist of those described for general wildlife in Section 4.19.2.7. These activities impact Utah prairie dogs through the long-term removal and short-term degradation of habitat, as well as habitat fragmentation and increased human-induced disturbances. RFFAs consist of those listed in Table 4.19.1, totaling 75,815 acres of disturbance consisting of ongoing and increasing mineral development, ongoing energy projects, road improvement projects, ongoing and increasing OHV use, increased vegetation treatments, and increased range improvements. The nature of impacts on Utah prairie dogs from RFFAs would be similar to that described for past and present activities.

The Proposed Action would increase existing traffic rates on the reasonably foreseeable coal haul transportation route by 4% (including a 33% increase in heavy truck traffic) for 25 years. Impacts due to coal hauling from Alternative C and K1 would be identical to the Proposed Action, except the impacts would occur over a 21-year period and 16-year period, respectively. Increased traffic on the reasonably foreseeable coal haul route due to each alternative, coupled with current and reasonably foreseeable levels of traffic, would increase levels of mortality currently experienced by Utah prairie dog colonies that occur along the roadside. In addition, the effects of road barrier impacts would be amplified, discouraging some individuals from crossing the road, leading to higher potential for some colonies to become genetically isolated and ultimately lost. Genetic fragmentation and isolation would reduce the health of the entire population.

4.19.2.18.2 Greater Sage-Grouse

The Greater Sage-Grouse CIAA is the same as the analysis area as defined in Section 3.18.3. The CIAA consists of the geographical boundary surrounding the Panguitch sage-grouse population. The current environmental condition of the sage-grouse habitat on the tract is described in Section 3.18.3. These conditions have occurred as a result of past and present actions in the CIAA. In addition to the actions listed for general wildlife, quantifiable past and present activities that impact sage-grouse in the CIAA stem primarily from vegetation treatments and mining activities. Past and present vegetation treatments consist of those associated with the adjacent Coal Hollow Mine as well as 26,996 acres of treatments completed by the BLM in the areas assessed by the *Upper Kanab Creek Watershed Vegetation Management Project Environmental Assessment* (BLM 2010d) and the *South Canyon Vegetation Enhancement Environmental Assessment* (BLM 2010c) (see Map 3.23), all of which are described in detail in Section 3.18.3.4.2. These vegetation treatments consist of removing conifer trees that have encroached on sagebrush habitat. This type of vegetation treatment is generally thought to provide a timely and effective increase of available habitat for local sage-grouse (Baruch-Mordo et al. 2013; Commons et al. 1999), and this available habitat has been observed to be used by grouse in the Alton–Sink Valley during the year following treatment (Frey 2008, 2010; Frey et al. 2013). In general, these vegetation treatments have improved grouse habitat and connectivity between populations in the CIAA.

An additional present action impacting grouse in the CIAA is the ongoing coal mining on the Coal Hollow parcel, as described in Section 3.18.3.4.3. It is possible that the local sage-grouse have adapted and become habituated to mining activities, because there have been repeated observations of grouse close to mining equipment. However, exact impacts on the grouse remain unclear due to the potential for a time-lag effect on grouse behavior (Harju et al. 2010).

Of the estimated 75,815 acres of surface disturbance from RFFAs in the CIAA, approximately 60,000 acres (or 79% of the total 75,815 acres) are anticipated to undergo additional vegetation treatments similar to those described above. These treatments would further increase habitat availability and connectivity for the Panguitch sage-grouse population. The remaining 15,815 acres of RFFAs consist of actions that would contribute to habitat destruction, disturbance, and fragmentation for the sage-grouse population, the nature of which is described in Section 4.18.2.4.2.

Under the Proposed Action, approximately 1,992 acres of occupied sage-grouse habitat would undergo surface-disturbing activities over the life of the mine (51% of the tract, 0.7% of the CIAA). Impacts to grouse from mining activities are described in detail in Section 4.18.2.4.2. The design features described in that section would apply to all alternatives. These design features would require pre-mining vegetation treatment, reclamation, and on- and off-tract mitigation measures to be carried out. Off-tract mitigation would require that vegetation treatment projects are completed that create sage-grouse habitat at a rate of 4 acres of treated habitat for every 1 acre disturbed. These treatments must be completed no more than one year after the corresponding on-tract surface disturbance occurs. The complete list of design features ensures compliance with the IM 2012-043 requirement to "cumulatively maintain and enhance Greater Sage-Grouse habitat" by instituting requirements centered on maintaining and creating sage-grouse habitat in the CIAA. The anticipated results from the combined pre-mining vegetation treatment, reclamation, and mitigation actions are based on observations from previously conducted telemetry observations, reclamation projects, and vegetation treatments in the KFO, and are described in detail in Section 4.18.2.1.2.1.

Although 1,992 acres of surface disturbance would occur under the Proposed Action, the required design feature for off-site vegetation treatments at a 4:1 ratio coupled with the required timing of treatment completion (no more than one year after the corresponding disturbance) and the high probability that grouse would use treated habitat would off-set the surface disturbances in the short term. The required tract reclamation measures would off-set long-term impacts by requiring that the tract is restored to functioning sage-grouse habitat. Because the habitat of the tract is currently experiencing a high degree of conifer encroachment, tract reclamation would increase the quality of available sage-grouse habitat in the CIAA in the long term and ultimately have a beneficial effect on sage-grouse.

Alternatives C and K1 would contribute an additional 1,661 acres (0.6% of the CIAA) and 1,012 acres (0.4% of the CIAA), respectively, of surface disturbance to the past, present, and RFFAs in the CIAA. The required design features described in Section 4.18.2.4.2 would apply to all alternatives. The short- and long-term impacts from pre-mining vegetation treatment, reclamation standards, and on- and off-tract mitigation would be the same under all alternatives except that due to the tract size and corresponding amount of surface disturbance, more vegetation treatments would be required under the Proposed Action than under Alternatives C and K1, as displayed in Table 4.19.15.

Table 4.19.15. Required Acres of Mitigation Vegetation Treatments Based on 4:1 Mitigation Ratio Requirement by Alternative

	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C (Reduced Tract Acreage and Seasonal Restrictions)	Alternative K1 (Reduced Tract Acreage)
Occupied habitat	0	7,258.0	6,051.6	3,656.4

Note: Data from this table are based on acres of direct disturbance by alternative, as displayed in Table 1.1.1.

Compliance with these requirements would ensure there would be no net loss of habitat for Greater Sage-Grouse, and would lead to a cumulative net increase of available habitat for the population as a whole in both the short and long term. Many of the locations that would be enhanced, reclaimed, and treated may not otherwise be completed without the funding made available by mining activities. In the long term, the enhanced habitats of the tract, mined areas reclaimed to sagebrush, and increased availability of habitat population-wide would further BLM's objectives of maintaining and enhancing habitat for Greater Sage-Grouse, and would thereby aid in the stabilization or increase of the Panguitch population. The ability to increase habitat availability and connectivity between breeding groups would increase the health and resiliency of the group breeding near the tract, as well as increase the capacity for the population as a whole to increase.

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